2000 Annual Report
Monitoring Events 16 and 17
Site 9: Neptune Drive Disposal Site
Naval Air Station, Brunswick, Maine

Contract No. N62472-92-D-1296
Contract Task Order No. 0047

Prepared for

Department of the Navy
Engineering Field Activity Northeast
Naval Facilities Engineering Command
10 Industrial Highway
Mail Stop No. 82
Lester, Pennsylvania 19113-2090

Prepared by

EA Engineering, Science, and Technology
The Maple Building
3 Washington Center
Newburgh, New York 12550

June 2002
FINAL
296.0047

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Alexander C. Easterday, P.G.
CTO Manager

5 June 2002
Date

Kenneth W. Kilmer
Program Manager

5 June 2002
Date

June 2002
FINAL
296.0047

QUALITY REVIEW STATEMENT

Contract No. N62472-92-D-1296 EA Project No.: 29600.47
Contract Task Order No. 0047
Activity: Naval Air Station, Brunswick, Maine

Description of Report/Deliverable:

Final 2000 Annual Report – Monitoring Events 16 and 17, Site 9: Neptune Drive Disposal Site, Naval Air Station, Brunswick, Maine

EA CTO Manager: Alexander C. Easterday, P.G.

In compliance with EA's Quality Procedures for review of deliverables outlined in the Quality Management Plan, this final deliverable has been reviewed for quality by the undersigned Senior Technical Reviewer(s). The information presented in this report/deliverable has been prepared in accordance with the approved Implementation Plan for the Contract Task Order (CTO) and reflects a proper presentation of the data and/or the conclusions drawn and/or the analyses or design completed during the conduct of the work. This statement is based upon the standards identified in the CTO and/or the standard of care existing at the time of preparation.

Senior Technical Reviewer

Kevin Scully for 6/5/02

Kevin Scully, LSP, P.G. (Date)
Hydrogeologist

QUALITY REVIEW STATEMENT

Contract No. N62472-92-D-1296 EA Project No.: 296.0047
Contract Task Order No. 47
Activity: Naval Air Station, Brunswick, Maine

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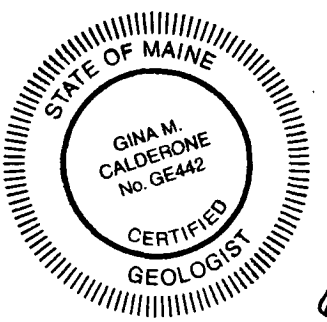
Final 2000 Annual Report – Monitoring Events 16 and 17, Site 9: Neptune Drive Disposal Site, Naval Air Station, Brunswick, Maine

EA CTO Manager: Alexander C. Easterday, P.G.

As per State of Maine Department of Professional and Financial Regulations, Title 32 Chapter 73, Law, the sections of this document related to geology and geologic data interpretation have been reviewed for its technical content by the undersigned State of Maine Certified Geologist.

Specifically, Chapters 2 and 3 and Figures 2-1 and 2-2 of this document have been reviewed by the undersigned for their geological interpretive content. This statement is based upon the review of the undersigned conducted during the preparation of this report, as dated below.



Certified Geologist Reviewer

Gina M. Calderone 6/4/02

Gina M. Calderone, CPG, CG (Date)
State of Maine Certified Geologist (No. GE442)

CONTENTS

Page

Page

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

1.1 BACKGROUND

Under Contract No. N62472-92-D-1296, Contract Task Order No. 0047, Engineering Facility Activity Northeast, Naval Facilities Engineering Command contracted with EA Engineering, Science, and Technology to perform long-term monitoring at the Neptune Drive Disposal Site (Site 9), Naval Air Station (NAS), Brunswick, Maine. NAS Brunswick is located between the Androscoggin River and Middle Bay/Harpswell Cove approximately 1 mi southwest of Cooks Corner (Figure 1-1). The layout of Site 9 is shown on Figure 1-2.

NAS Brunswick is an active base owned and operated by the Federal government through the Department of the Navy. In 1987, NAS Brunswick was placed on the National Priorities List by the U.S. Environmental Protection Agency (EPA) and is currently participating in the Navy's Installation Restoration Program. At Site 9, the Navy is performing long-term monitoring and maintenance as part of the long-term remedial actions required by the Final Record of Decision dated September 1999 (EA 1999a). In August 1999, the final Long-Term Monitoring Plan (LTMP) (EA 1999b) was established pursuant to the Final Record of Decision (EA 1999a). This LTMP document serves as the basis for conducting long-term monitoring activities. The selected site remedy is natural attenuation with long-term monitoring and institutional controls. The major components of the selected remedy are described within the Final Record of Decision (EA 1999a).

1.2 LONG-TERM MONITORING PROGRAM

The LTMP document, which is comprised of a Long-Term Monitoring Program and an addendum to the Quality Assurance Project Plan contained in the LTMP for Building 95, Sites 1 and 3, and Eastern Plume (ABB-ES 1994), lists the requirement for monitoring, sampling, and analysis of ground water, surface water, and sediment, along with the implementation of institutional controls to prevent human contact with ground water in the area. The LTMP for Site 9 was finalized in August 1999.

The objective of the Long-Term Monitoring Program is to obtain data necessary to evaluate the long-term effectiveness of the remedial action (i.e., natural attenuation with long-term monitoring and institutional controls) conducted at Site 9. Monitoring and sampling data collected during the performance of long-term monitoring are being used to:

- Monitor changes in the plume boundaries and potential migration pathways
- Monitor effectiveness of the remedial action for the protection of human health and the environment

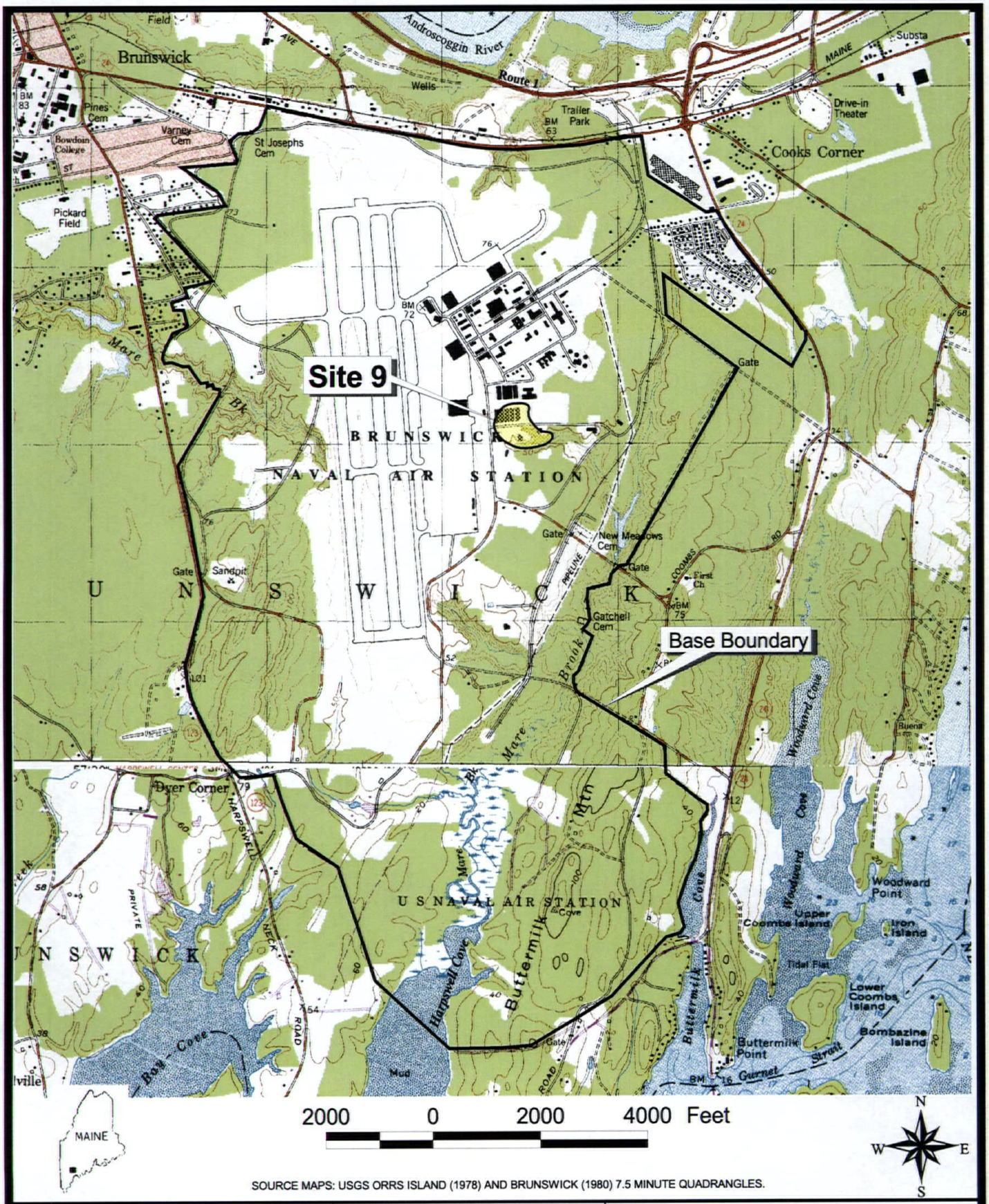
- Evaluate whether the inactive landfill contents are impacting ground water
- Monitor the volatile organic compound contamination to evaluate the effectiveness of natural attenuation and determine trends with time
- Monitor impact to the environment due to Site 9.

A summary of the sampling and gauging conducted during 2000 is provided in Table 1-1. Although not required by the LTMP, 9 monitoring wells at the Navy Exchange Service Station site were gauged as part of Monitoring Events 16 and 17 to assess ground-water flow patterns upgradient of Site 9 where an active air sparging system is operating to address petroleum-impacted soil and ground water. Ground-water elevation data were gathered to assess changes in the pathway of ground-water flow from the Navy Exchange Service Station air sparging remedial area into Site 9. Additional information on site gauging and sampling activities completed during 2000 can be found in the reports for Monitoring Events 16 and 17 for Site 9 (EA 2000a, 2000b). A complete description of site geologic conditions is not presented in this Annual Report, but can be found in the 1999 Annual Report for Site 9 (EA 2000c). A geologic cross-section of the site is shown on Figure 1-3 to illustrate general site geology.

1.3 ANNUAL REPORT ORGANIZATION

This 2000 Annual Report details the project activities conducted as part of the Long-Term Monitoring Program at Site 9 during the two monitoring and sampling events of 2000. Monitoring Event 16 was completed during April 2000. Monitoring Event 17 was completed during September 2000. The data summary tables, ground-water contour maps, and VOC contour maps are only presented in the monitoring event reports. When these items are cited in the annual report text, a reference will be made to the appropriate monitoring event report. The site geology and background sections have not changed since 1999 and, therefore, are not presented within annual reports. If new geologic information is generated that would allow for refinement of the conceptual model as presented in the Final Record of Decision for Site 9 (EA 1999a), this information would then be included in the future annual report covering the year in which the work was completed.

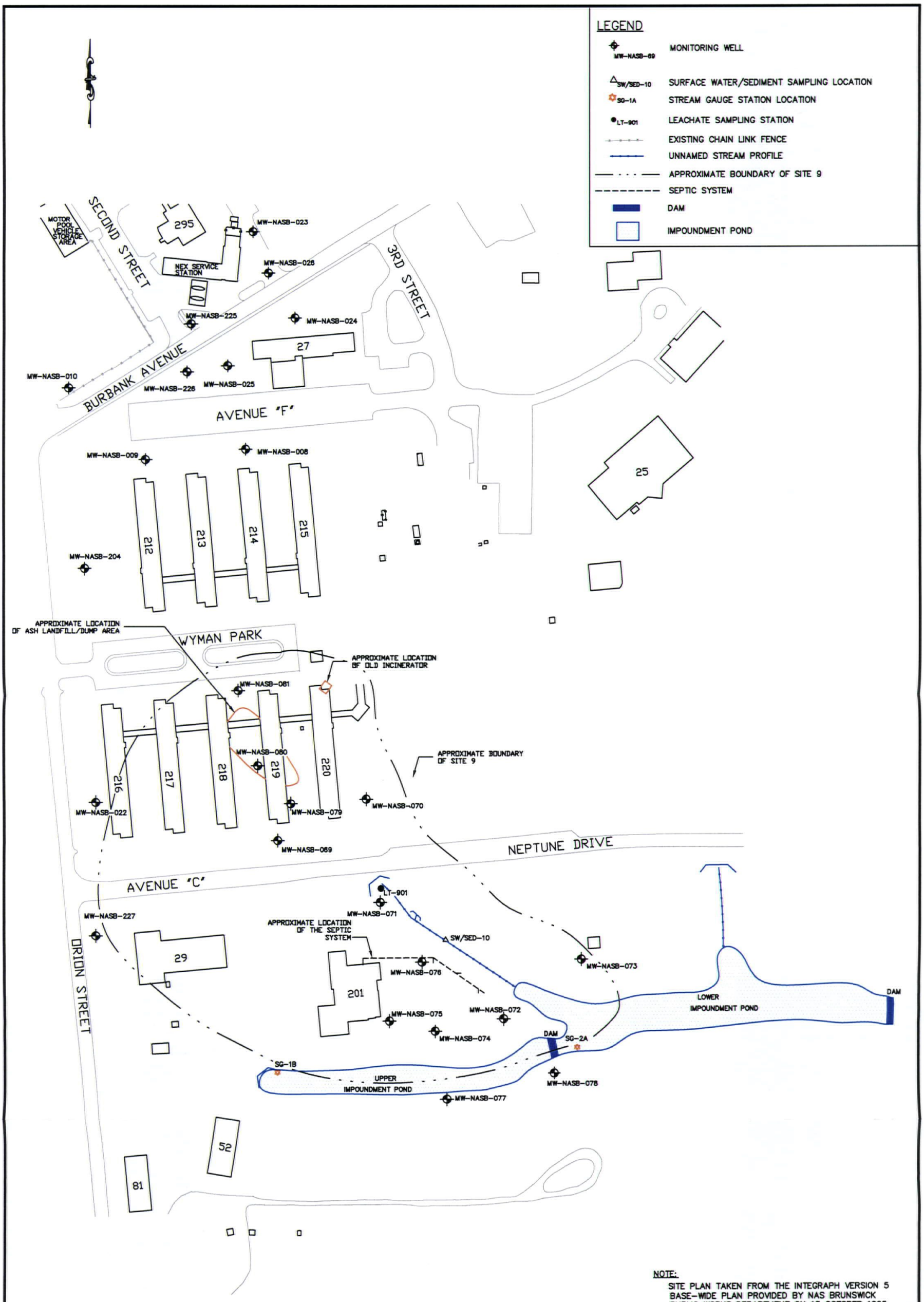
The format of the annual report is as follows. Chapter 1 provides an introduction and overview of the Long-Term Monitoring Program activities conducted at the site. Chapter 2 presents the results of the two monitoring events conducted during 2000. Chapter 3 presents conclusions and recommendations based on site data. Graphs showing trends of data collected during the Long-Term Monitoring Program are presented in Appendix A. Appendix B provides responses to regulator comments received regarding the reports for Monitoring Events 16 and 17.



SOURCE MAPS: USGS ORRS ISLAND (1978) AND BRUNSWICK (1980) 7.5 MINUTE QUADRANGLES.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY	NAVAL AIR STATION BRUNSWICK, MAINE	FIGURE 1 - 1 SITE LOCATION MAP, SITE 9 (NEPTUNE DRIVE DISPOSAL SITE)

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT No	FILE No
ACE	BT	BT	ACE	AS SHOWN	6 MARCH 2000	29600.47	I:\NASB_GIS \NAVY.APR



NOTE:
SITE PLAN TAKEN FROM THE INTEGRAPH VERSION 5 BASE-WIDE PLAN PROVIDED BY NAS BRUNSWICK PUBLIC WORKS DEPARTMENT ON 13 OCTOBER 1995.

FILE No. F:\FEDERAL\DOD\NAVY\2960047\CAD\ANNUAL\SITE9\2000\SITEPLAN.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

SITE 9
(NEPTUNE DRIVE DISPOSAL SITE)
NAVAL AIR STATION
BRUNSWICK, MAINE

FIGURE 1-2
SITE PLAN

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
AE	SAP	SAP	SYC	1"=180'	9 JAN 2001	29600.47	SITEPLAN

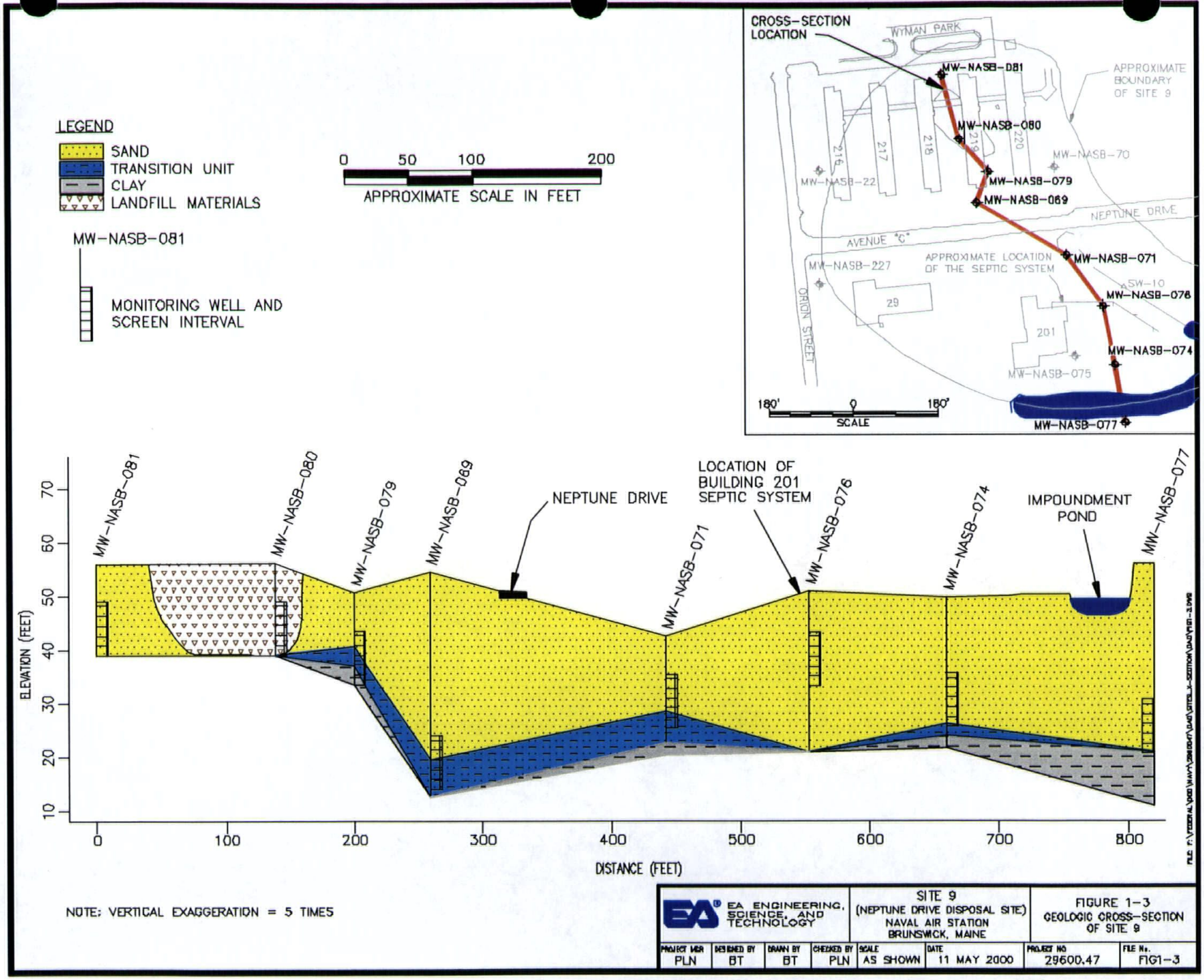

LEGEND
SAND
TRANSITION UNIT
CLAY
LANDFILL MATERIALS
MW-NASB-081
MONITORING WELL AND SCREEN INTERVAL
0 50 100 200
APPROXIMATE SCALE IN FEET
CROSS-SECTION LOCATION
WYMAN PARK
APPROXIMATE BOUNDARY OF SITE 9
MW-NASB-081
MW-NASB-080
MW-NASB-079
MW-NASB-069
MW-NASB-071
MW-NASB-076
MW-NASB-074
MW-NASB-077
MW-NASB-070
MW-NASB-22
MW-NASB-227
MW-NASB-075
NEPTUNE DRIVE
AVENUE "C"
ORION STREET
APPROXIMATE LOCATION OF THE SEPTIC SYSTEM
SW-10
216
217
218
219
220
29
201
180' 0 180'
SCALE
MW-NASB-081
MW-NASB-080
MW-NASB-079
MW-NASB-069
NEPTUNE DRIVE
LOCATION OF BUILDING 201 SEPTIC SYSTEM
MW-NASB-071
MW-NASB-076
MW-NASB-074
IMPOUNDMENT POND
MW-NASB-077
ELEVATION (FEET)
10 20 30 40 50 60 70
0 100 200 300 400 500 600 700 800
DISTANCE (FEET)
NOTE: VERTICAL EXAGGERATION = 5 TIMES
EA ENGINEERING, SCIENCE, AND TECHNOLOGY
SITE 9
(NEPTUNE DRIVE DISPOSAL SITE)
NAVAL AIR STATION
BRUNSWICK, MAINE
FIGURE 1-3
GEOLOGIC CROSS-SECTION OF SITE 9
PROJECT MGR PLN
DESIGNED BY BT
DRAWN BY BT
CHECKED BY PLN
SCALE AS SHOWN
DATE 11 MAY 2000
PROJECT NO 29600.47
FILE No. FIG1-3

TABLE 1-1 SUMMARY OF 2000 LONG-TERM MONITORING PROGRAM AT SITE 9, NAVAL AIR STATION, BRUNSWICK, MAINE

Well Designation	Previous Well Designation	2000 Sampling Dates	Sample Parameters		
			TCL VOC	TAL Elements/SVOC	Water Level Gauging[a]
Monitoring Wells					
MW-NASB-069	MW-901	April, September	X	X[b]	X
MW-NASB-070	MW-902	April, September	---	X[b]	X
MW-NASB-071	MW-903	April, September	X	---	X
MW-NASB-072	MW-904	April, September	X	---	X
MW-NASB-073	MW-905	Not sampled	---	---	X
MW-NASB-074	MW-906	April, September	X	---	X
MW-NASB-075	MW-907	April, September	X	---	X
MW-NASB-076	MW-908	April, September	X	---	X
MW-NASB-077	MW-909	April	X[c]	---	X
MW-NASB-078	MW-910	Not sampled	---	---	X
MW-NASB-079	MW-914	April, September	---	X[b]	X
MW-NASB-080	MW-915	April, September	X	---	X
MW-NASB-081	MW-916	Not sampled	---	---	X
MW-NASB-022	None	April, September	X	---	X
MW-NASB-204	None	Not sampled	---	---	X
MW-NASB-227	None	April, September	X	---	X

Sample Location	2000 Sampling Dates	Sample Parameters		
		TCL VOC	TAL Elements	Water Level Gauging
Seep Station				
LT-901 (SEEP)	April, September	X	NR	---
Surface Water				
SW-010	April, September	X	NR	---
Sediment				
SED-010[d]	April, September	NR	X	---
Surface Water Impoundment				
SG-01A[e]	Not sampled	---	---	X
SG-02A	Not sampled	---	---	X

(a) Water level gauging was conducted during March and September 2000.
(b) Sample was analyzed for semivolatile organic compounds by the U.S. Environmental Protection Agency (EPA) Method 8270C.
(c) Monitoring well MW-NASB-077 sample was analyzed using EPA Method 8260B Modified for selected ion mass for vinyl chloride.
(d) Location SED-010 was analyzed for TCL VOC during Monitoring Event 16 due to field error.
(e) Stream gauge SG-1A was found missing during the March 2000 gauging event. It was replaced and resurveyed as part of Monitoring Event 17 and designated as SG-1B.

NOTE: TCL = Target Compound List.
VOC = Volatile organic compounds by EPA Method 8260.
TAL = Target Analyte List by EPA Method 6010/7000.
SVOC = Semivolatile organic compounds.
Nine Naval Exchange Service Station monitoring wells were gauged during March and September 2000, although they are not part of Site 9.
Dashes (---) indicate sample parameter was not collected.
Sample locations, frequency, and collection methods for 2000 were implemented in accordance with the Final Long-Term Monitoring Plan (EA 1999b). Analytical methods and detection limits were established in the Final Record of Decision (EA 1999a).

2. LONG-TERM MONITORING PROGRAM RESULTS—2000

2.1 WATER LEVEL GAUGING PROGRAM

During the 2000 monitoring events, 16 ground-water monitoring wells at Site 9 were gauged to obtain depth to water. Well gauging was conducted as part of bi-annual sampling events completed on 27 March and 5 September 2000. Nine additional monitoring wells associated with the Navy Exchange Service Station were gauged as part of Monitoring Events 16 and 17 to assess ground-water flow patterns upgradient of Site 9. One stream gauge (SG-1A) was found to be missing on 27 March 2000, and was subsequently replaced and surveyed as part of Monitoring Event 17. The new stream gauge was designated as SG-1B. A summary of 2000 gauging data is presented in the reports for Monitoring Events 16 and 17 (EA 2000a, 2000b).

The interpreted water table contour maps for Monitoring Events 16 and 17 are included as Figures 2-1 and 2-2.

2.2 GROUND-WATER MONITORING AND SAMPLING PROGRAM

Ground-water samples were collected during Monitoring Events 16 and 17 from monitoring wells at Site 9. A summary of the wells included in the Long-Term Monitoring Program at Site 9 is provided in Table 1-1.

Summaries of those compounds/analytes detected in ground-water samples collected during the two sampling events, and those listed as contaminants of concern for Site 9, are provided in Appendix A of the Monitoring Events 16 and 17 reports. The analytical results of ground-water samples were compared against State of Maine's Maximum Exposure Guidelines (MEGs) and Federal Maximum Contaminant Levels (MCLs) to assess whether analytes detected in site ground-water samples exceeded applicable regulatory criteria.

2.2.1 Volatile Organic Compounds

Vinyl chloride was reported at concentrations above the corresponding Federal MCL or State MEG in samples from 3 monitoring wells sampled during 2000 (MW-NASB-069, MW-NASB-076, and MW-NASB-080). During the April 2000 sampling event, vinyl chloride was detected at concentrations of 55 µg/L in MW-NASB-069, 53 µg/L in the duplicate sample from MW-NASB-069, and 3 µg/L in MW-NASB-076. In September 2000, vinyl chloride was detected at a concentration of 60 µg/L in monitoring well MW-NASB-069 and in the duplicate sample collected at MW-NASB-069 (the highest vinyl chloride concentration detected in 2000). Vinyl chloride was detected at concentrations of 8 µg/L and 9 µg/L in MW-NASB-076 and MW-NASB-080, respectively, in September 2000.

No other VOCs were reported above the MEG or MCL in the samples collected during 2000 sampling activities. Graphs showing VOC trends for Monitoring Events 1 through 17 are presented in Appendix A. Note that contaminants that were detected in the associated method blank have not been used when calculating the total VOC values. VOC results are summarized in Appendix A of the reports for Monitoring Events 16 and 17.

VOC indicators of natural attenuation assessed during 2000 and throughout the LTMP include vinyl chloride trends over the Long-Term Monitoring Program and the ratio of vinyl chloride to 1,2-dichloroethene (DCE) over time.

2.2.2 Vinyl Chloride Trend Data

Figure 2-3 illustrates total VOC and vinyl chloride trends for long-term monitoring data collected between 1995 and 2000 for the 7 monitoring wells in which vinyl chloride concentrations were detected in samples collected for analysis. Regression analyses of vinyl chloride data are presented for the 1995-2000 time period, and separately for 1999-2000 data, to illustrate changing trends with time. The table below summarizes the trends as indicated by the least-mean square regressions shown on Figure 2-3:

Vinyl Chloride Trends			
Well	1995–2000	1999–2000	2000
MW-NASB-069	Increasing	Increasing	Increasing
MW-NASB-071	Steady at non-detection	Steady at non-detection	Steady at non-detection
MW-NASB-072	Decreasing	Steady at non-detection	Steady at non-detection
MW-NASB-074	Decreasing	Steady at non-detection	Steady at non-detection
MW-NASB-075	Decreasing	Steady at non-detection	Steady at non-detection
MW-NASB-076	Increasing	Increasing	Increasing
MW-NASB-080	Steady	Increasing	Increasing

2.2.3 Vinyl Chloride/Total Dichloroethene Ratio

The assessment of the vinyl chloride/DCE ratio provides a measure of the rate of dechlorination in ground water as noted by changing concentrations of the parent-daughter compounds. A higher vinyl chloride/total 1,2-DCE ratio indicates increasing dechlorination. Figure 2-4 shows trend data for the ratio of vinyl chloride to total DCE for Monitoring Events 1 through 17 for wells where both compounds were detected in samples. Figure 2-5 illustrates the sum of vinyl chloride and 1,2-DCE concentrations from Site 9 monitoring wells for the long-term monitoring and sampling program from 1995 through 2000. The table below summarizes the trends in the vinyl chloride to total DCE ratios as shown on Figure 2-3:

Vinyl Chloride to DCE Ratio	
Well	1995-2000 Trend
MW-NASB-069	Increasing
MW-NASB-072	Increasing
MW-NASB-074	Decreasing
MW-NASB-075	Decreasing
MW-NASB-076	Increasing
MW-NASB-080	Increasing

Figure 2-5 shows the sum of vinyl chloride concentrations (daughter compound) and total 1,2-DCE concentrations (parent compound) between 1995 and 2000. The concentrations of both compounds have been increasing on an annual basis. The analysis of the September 2000 data showed a slight decrease in total 1, 2-DCE concentrations, however, vinyl chloride has showed a sustained rate of increase based on data from the previous 4 monitoring events (i.e., April 1999 through September 2000). Note that the majority of the increase in vinyl chloride concentrations illustrated on Figure 2-5 is the result of increases at one monitoring point (MW-NASB-069).

2.2.4 Semivolatile Organic Compounds

No SVOCs were detected in the ground-water samples during Monitoring Events 16 and 17.

2.2.5 Inorganic Analytes

Inorganic analytes were reported in each of the samples collected from 3 wells (MW-NASB-069, MW-NASB-070, and MW-NASB-079) analyzed for metals during the 2000 monitoring events. The concentration of three inorganic analytes (iron, manganese, and thallium) was detected above the corresponding State MEG and/or Federal MCL during both sampling events in 2000. Iron was detected in excess of the Federal MCL in samples collected from monitoring wells MW-NASB-069 (duplicate) and MW-NASB-079 at concentrations of 447 µg/L and 23,300 µg/L, respectively, during the September 2000 sampling event. Manganese was detected at concentrations of 703 µg/L and 589 µg/L in monitoring well MW-NASB-069 in April and September 2000, respectively. The duplicate samples collected at MW-NASB-069 had similar detected concentrations of manganese at 719 µg/L and 594 µg/L in April and September 2000, respectively. Manganese was detected above the Federal MCL in monitoring wells MW-NASB-070 and MW-NASB-079 during the April and September 2000 sampling events. Thallium was detected above the State MEG/Federal MCL in two wells (MW-NASB-069 and MW-NASB-079) during the September 2000 sampling event. The inorganic results are summarized in Appendix A of the reports for Monitoring Events 16 and 17.

2.3 SURFACE WATER, SEDIMENT, AND SEEP SAMPLING

Surface water and sediment samples were collected from one location (SW/SED-010) during the 2000 monitoring events along the northern unnamed stream. A seep sample was collected from

one location (LT-901) during each of the 2000 monitoring events. Table 1-1 summarizes the surface water, sediment, and seep sampling and analytical program completed at Site 9 in 2000.

2.3.1 Surface Water Sample

Vinyl chloride was detected in surface water sample SW-010 during Monitoring Event 17. One additional VOC (1,2-DCE) was detected in surface water sample SW-010 at a concentration of 0.9J µg/L during Monitoring Event 17. No other VOCs were detected in the surface water samples collected during Monitoring Events 16 and 17. A summary of analytical results for surface water samples collected during 2000 is provided in Appendix A in the reports for Monitoring Events 16 and 17.

2.3.2 Sediment Sample

Vinyl chloride was not detected (<3 µg/L) in the sediment sample collected during Monitoring Event 16. Four VOCs (acetone, methylene chloride, total 1,2-dichloroethene, and trichloroethene) were detected in sediment sample SED-010 collected during Monitoring Event 16. A total of 18 analytes were reported in the sediment sample collected during the September 2000 sampling event. Notable results included aluminum detected at 4,550 µg/Kg, arsenic at 2.2 µg/Kg, iron at 5,340 µg/kg, and lead at 18.5 µg/Kg.

It should be noted that sediment samples were analyzed for VOCs only during the April sampling event and for Target Analyte List elements only during the September 2000 sampling event.

A summary of analytical results for sediment samples collected during 2000 is provided in Appendix A in the reports for Monitoring Events 16 and 17.

2.3.3 Seep Sample

There were no reported concentrations of vinyl chloride in the seep samples collected during 2000. One VOC analyte (acetone) was detected in the samples collected during Monitoring Events 16 and 17. A summary of analytical results for seep samples collected at sample station LT-901 are provided in Appendix A in the reports for Monitoring Events 16 and 17.

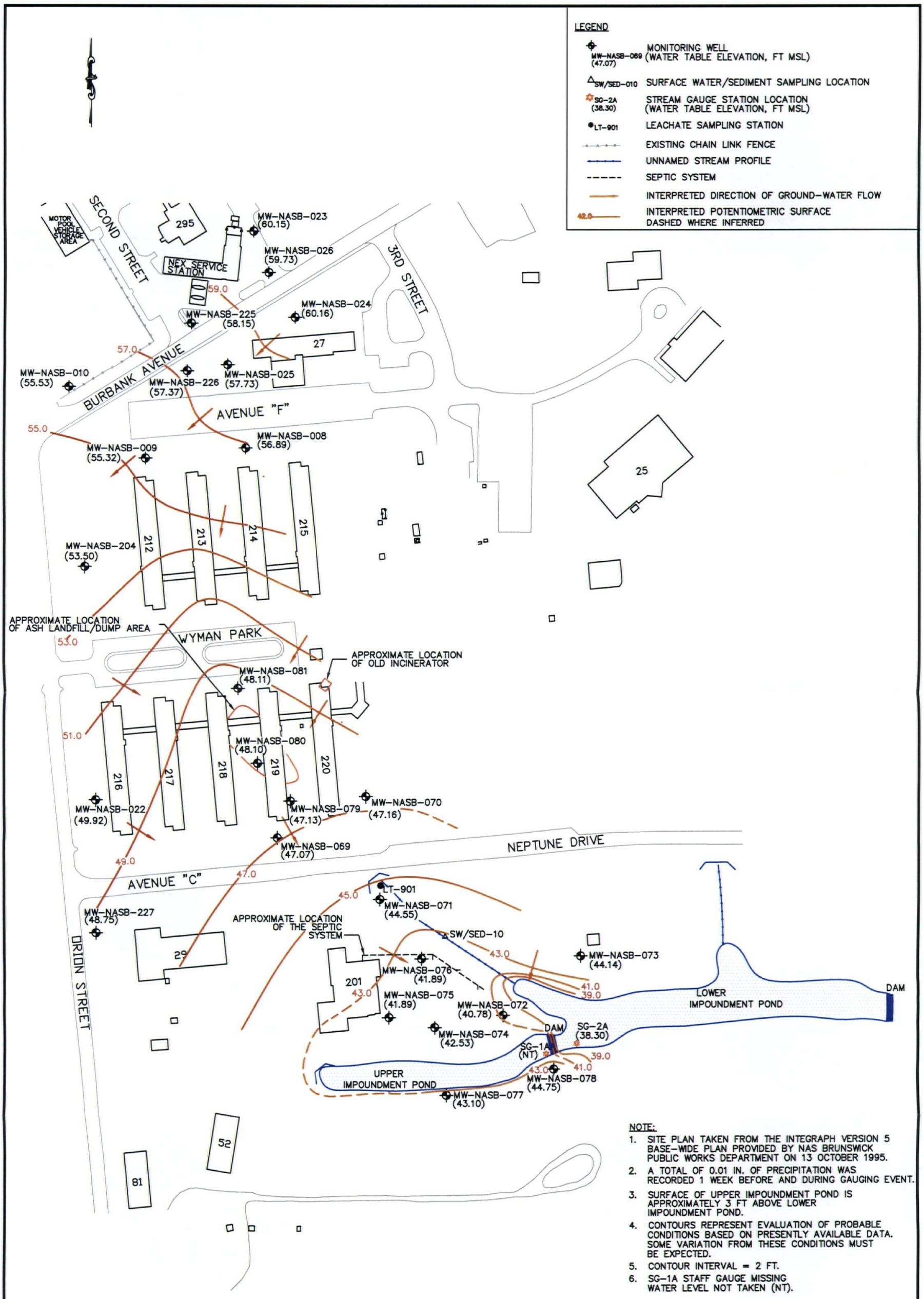
2.4 VISUAL INSPECTION

Site inspection activities were completed during the 2000 monitoring events by an engineer in accordance with the procedures established by the LTMP (EA 1999b). Site inspection activities included the following:

- Inspection of the ground surface for evidence of stressed vegetation
- Inspection of the onsite ground-water monitoring wells
- Inspection of the stream channel for evidence of additional seeps

On 11 April 2000 and 15 September 2000, a site inspection was completed by an engineer in accordance with the Final LTMP (EA 1999b). No evidence of stressed vegetation or physical evidence of tampering with site monitoring wells was observed. All monitoring wells at the site were found to be capped, labeled, locked, and in good condition.

One stream gauge (SG-1A) was found to be missing on 27 March 2000. The gauge was replaced in a different location along the upper impoundment pond and surveyed during Monitoring Event 17. The new stream gauge was renamed SG-1B.



NOTE:

1. SITE PLAN TAKEN FROM THE INTEGRAPH VERSION 5 BASE-WIDE PLAN PROVIDED BY NAS BRUNSWICK PUBLIC WORKS DEPARTMENT ON 13 OCTOBER 1995.
2. A TOTAL OF 0.01 IN. OF PRECIPITATION WAS RECORDED 1 WEEK BEFORE AND DURING GAUGING EVENT.
3. SURFACE OF UPPER IMPOUNDMENT POND IS APPROXIMATELY 3 FT ABOVE LOWER IMPOUNDMENT POND.
4. CONTOURS REPRESENT EVALUATION OF PROBABLE CONDITIONS BASED ON PRESENTLY AVAILABLE DATA. SOME VARIATION FROM THESE CONDITIONS MUST BE EXPECTED.
5. CONTOUR INTERVAL = 2 FT.
6. SG-1A STAFF GAUGE MISSING WATER LEVEL NOT TAKEN (NT).

FILE No. F:\FEDERAL\DOD\NAVY\29600047\CAD\LTMP\SITE9\2000\EVENT_16\S9MAR00.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

SITE 9
(NEPTUNE DRIVE DISPOSAL SITE)
NAVAL AIR STATION
BRUNSWICK, MAINE

FIGURE 2-1
INTERPRETED POTENTIOMETRIC SURFACE ELEVATIONS, 27 MARCH 2000 WELL GAUGING DATA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
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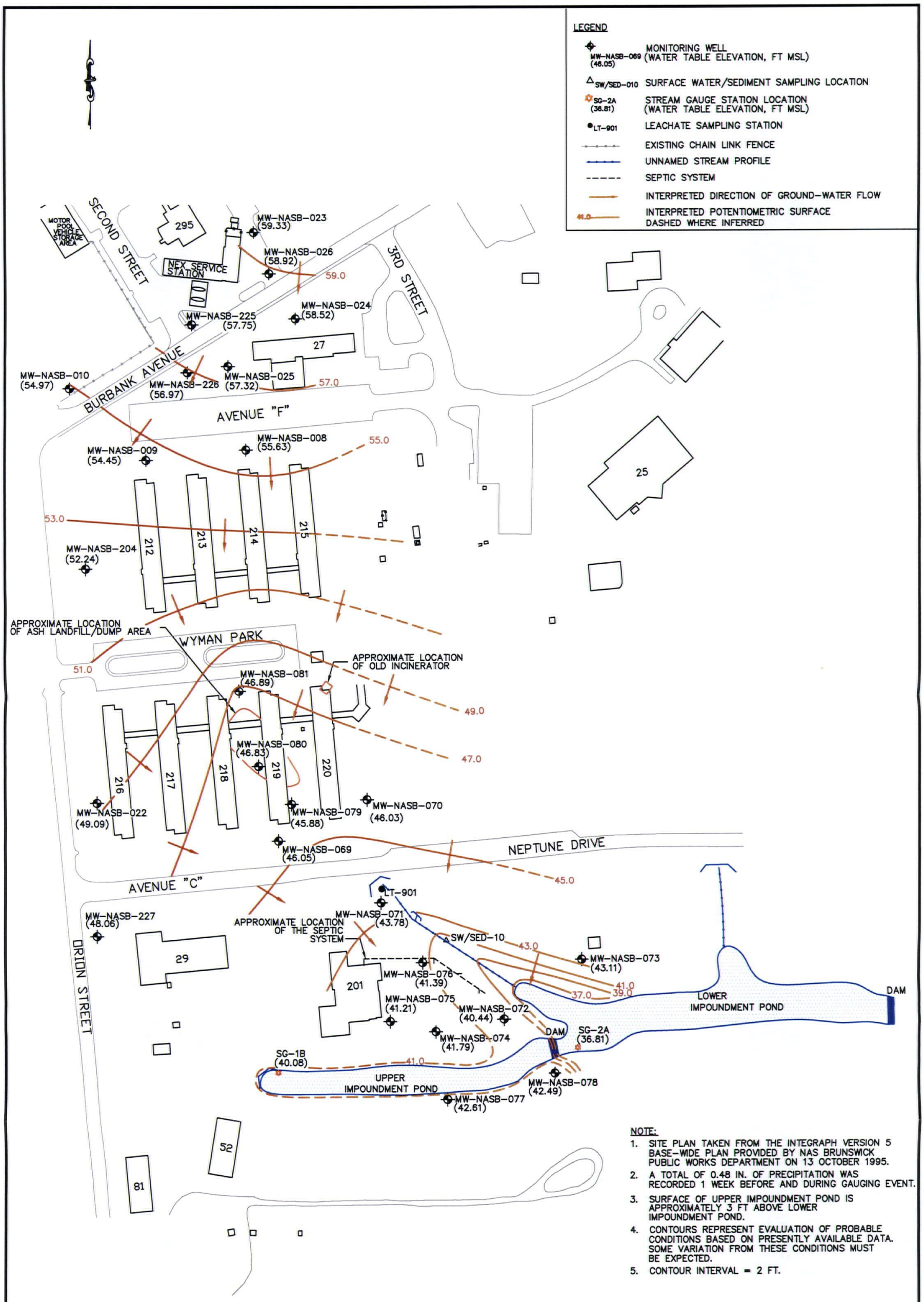

NOTE:

1. SITE PLAN TAKEN FROM THE INTEGRAPH VERSION 5 BASE-WIDE PLAN PROVIDED BY NAS BRUNSWICK PUBLIC WORKS DEPARTMENT ON 13 OCTOBER 1995.
2. A TOTAL OF 0.48 IN. OF PRECIPITATION WAS RECORDED 1 WEEK BEFORE AND DURING GAUGING EVENT.
3. SURFACE OF UPPER IMPOUNDMENT POND IS APPROXIMATELY 3 FT ABOVE LOWER IMPOUNDMENT POND.
4. CONTOURS REPRESENT EVALUATION OF PROBABLE CONDITIONS BASED ON PRESENTLY AVAILABLE DATA. SOME VARIATION FROM THESE CONDITIONS MUST BE EXPECTED.
5. CONTOUR INTERVAL = 2 FT.

FILE No. F:\FEDERAL\DOD\NAVY\2960047\CAD\LTMP\SITE9\2000\EVENT_17\S9SEP00.DWG

EA ENGINEERING, SCIENCE, AND TECHNOLOGY

SITE 9
(NEPTUNE DRIVE DISPOSAL SITE)
NAVAL AIR STATION
BRUNSWICK, MAINE

FIGURE 2-2
INTERPRETED POTENTIOMETRIC SURFACE ELEVATIONS, 5 SEPTEMBER 2000 WELL GAUGING DATA

PROJECT MGR	DESIGNED BY	DRAWN BY	CHECKED BY	SCALE	DATE	PROJECT NO	FILE No.
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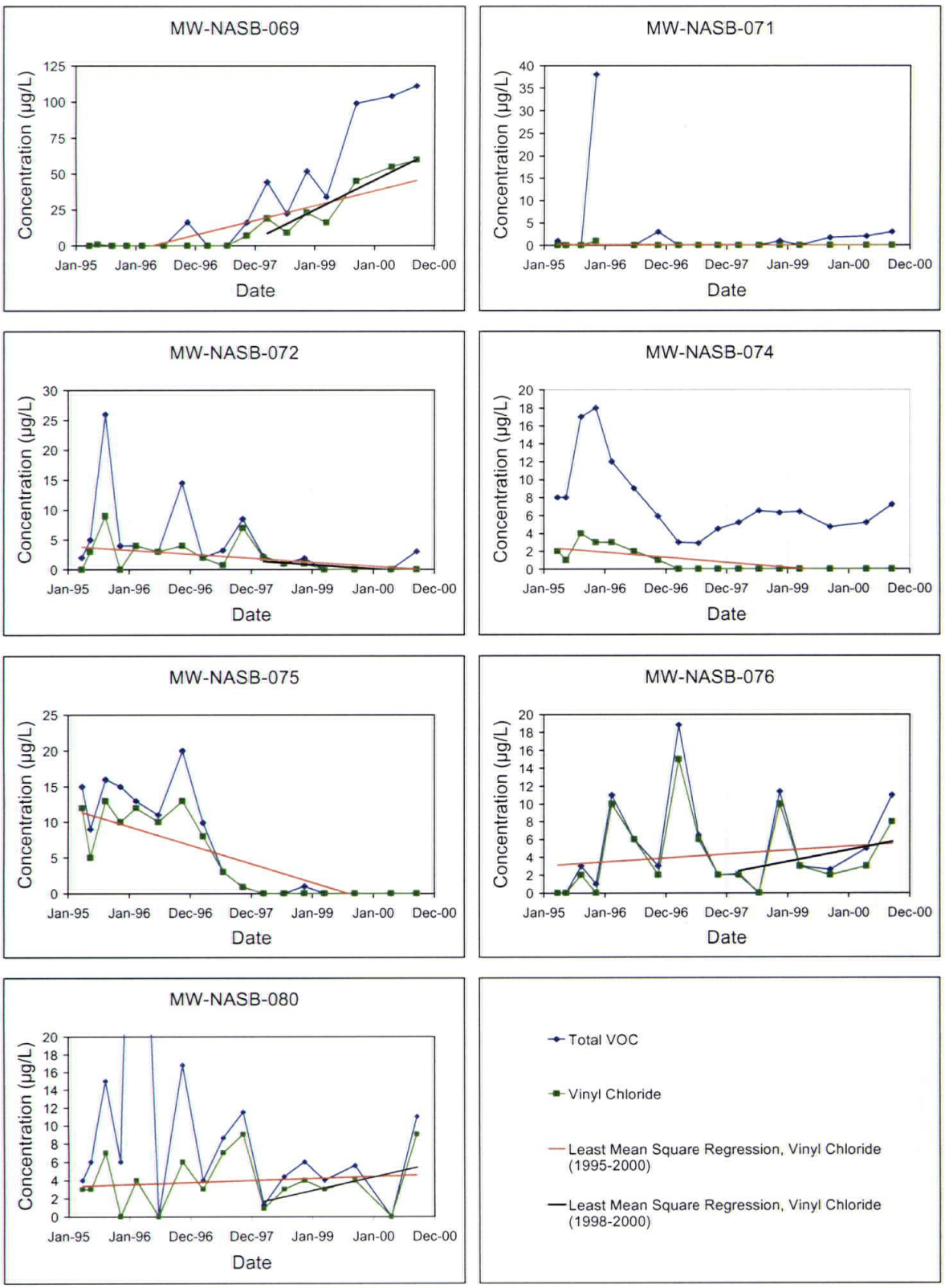
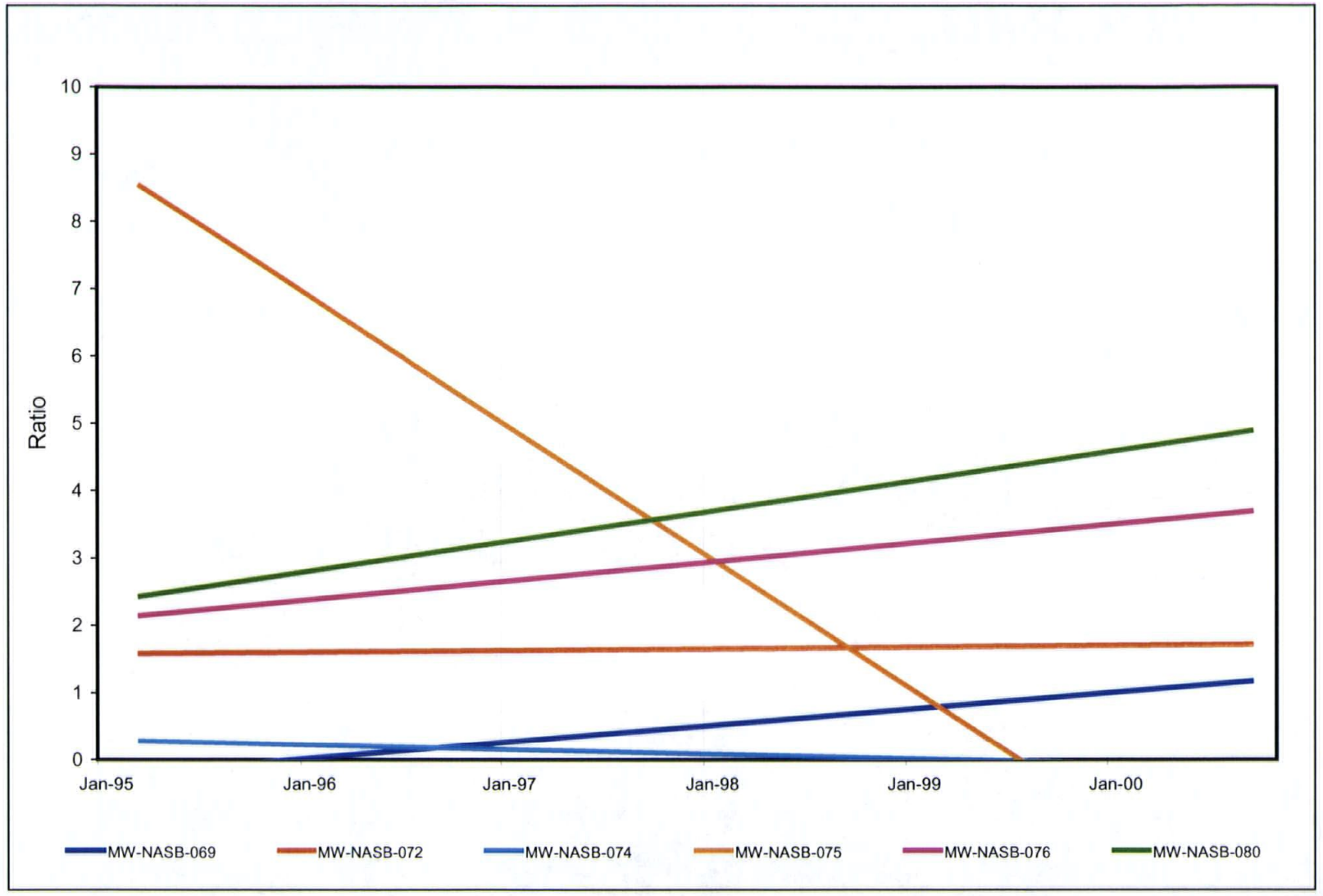


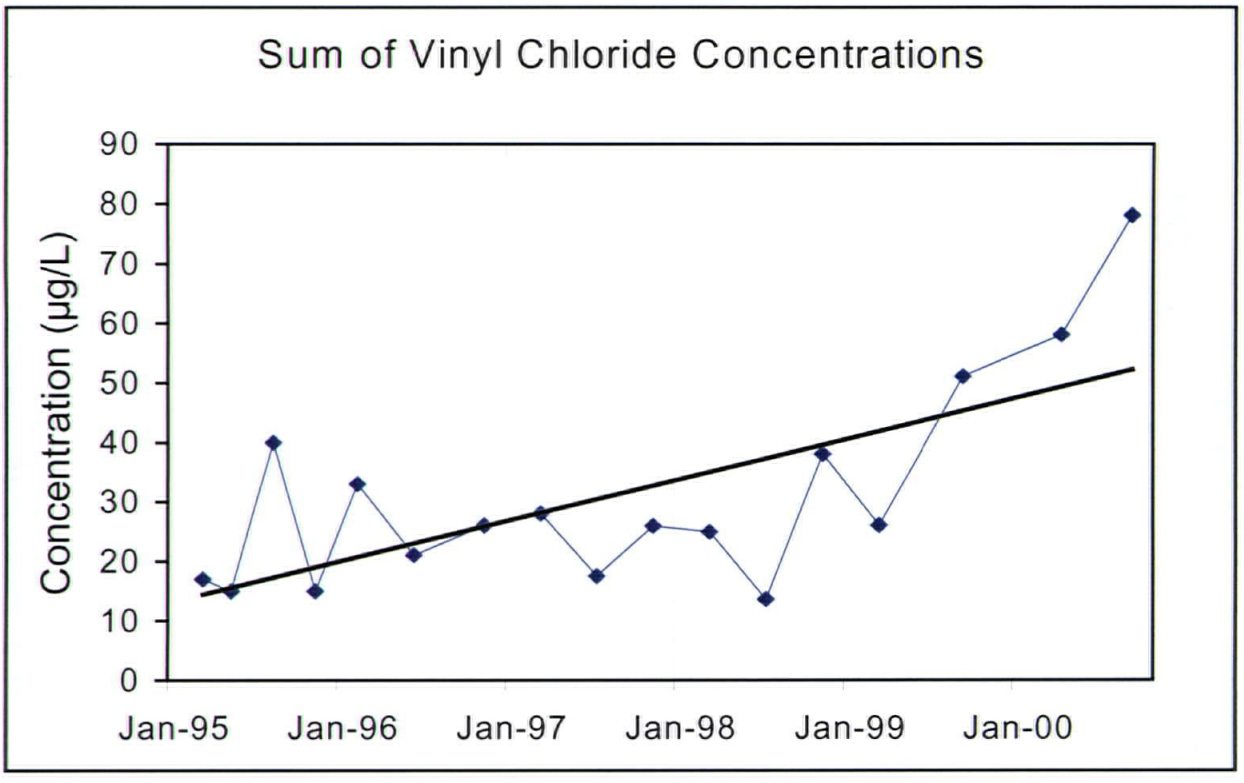
Note: Vinyl chloride concentrations less than the detection limit (2 µg/L) are plotted as a zero concentration on these charts. MW-NASB-080 graph scale enlarged to show vinyl chloride trends. Acetone concentration detected in February 1996 is considered laboratory contaminant and is shown off graph scale.

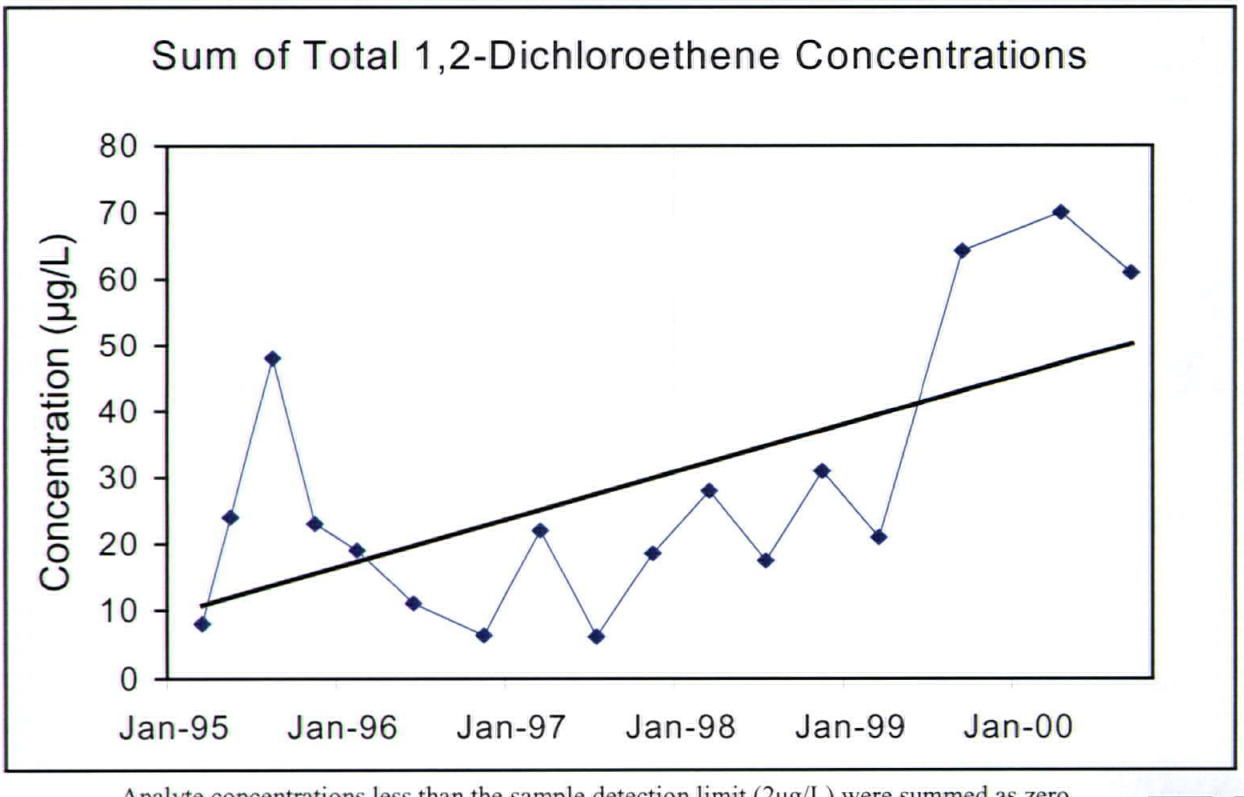
Figure 2-3. Total volatile organic compounds and vinyl chloride trends, 1995-2000.



NOTE: Higher vinyl chloride/total 1,2 -dichloroethene ratio indicates increasing dechlorination.
Lines show least mean square regression based on ratios of vinyl chloride to total 1,2-dichloroethene.

Figure 2-4. Vinyl chloride/total 1,2-dichloroethene ratio trends, Monitoring Events 1 through 17.





F:\Federal\DoD\Navy\2960047\ANNUAL\2000\Charts-Site 9\Fig2-3.doc

Analyte concentrations less than the sample detection limit (2µg/L) were summed as zero concentrations in these graphs.

Figure 2-5. Sum of the total concentrations of vinyl chloride and 1,2-dichloroethene for all site monitoring wells for monitoring events from 1995 to 2000.

3. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

3.1 SUMMARY AND CONCLUSIONS

3.1.1 Water Level Gauging Program

Results of the water level gauging program conducted during 2000 indicate that ground-water flow is generally to the south-southeast at Site 9, toward the unnamed stream located south of Neptune Drive. Based on five rounds of gauging data collected from monitoring wells at the Navy Exchange Service Station, the interpreted flow pattern upgradient of Site 9 is to the southwest. The interpreted hydraulic gradient shows an increasing gradient to the south. The steepest hydraulic gradients are observed in the vicinity of the northern and southern branches of the unnamed stream and in the vicinity of the impoundment ponds. This is consistent with previous gauging results.

Based on data collected during 2000, the following observations are noted:

- Shallow ground water north of Neptune Drive is likely to flow toward the northern branch of the unnamed streams and associated branch of the lower impoundment pond. Ground-water flow from the portion of Site 9 that is west and immediately south of Building 201 is likely to flow toward the upper impoundment pond. Ground-water flow to the north toward the upper impoundment pond is consistently observed south of the pond based on ground-water elevations collected at MW-NASB-077 and MW-NASB-078 south of Site 9. It is suspected that the quality of shallow ground water south of the pond is not linked to the quality of shallow ground water north of the pond.

3.1.2 Ground-Water Monitoring and Sampling Program

Water Quality Parameters

Water quality parameters, including pH, conductivity, temperature, dissolved oxygen, and turbidity, were measured during well purging. Although not required, oxidation-reduction potential (Eh) was recorded for informational purposes. Based on data collected during 2000, the following observations are noted:

- In a comparison of 2000 to 1999 dissolved oxygen data, 6 of 11 wells noted increased dissolved oxygen concentrations for Monitoring Event 14 through Monitoring Event 17. The dissolved oxygen concentrations measured in the remaining wells decreased or remained at a constant level between the Monitoring Event 14 and Monitoring Event 17 sampling events. The measured concentrations of dissolved oxygen in the Navy Exchange Service Station wells and in the areas north of Building 201 were similar.

- A comparison of Eh trend values for 1999 and 2000 shows a mix of increasing and decreasing values. The Site 9 trend of Eh was decreasing, with 7 wells exhibiting decreased levels of Eh and 4 wells exhibiting increasing Eh values as a year over year comparison.

Volatile Organic Compound Concentrations

The results of the ground-water sampling and analysis program conducted at Site 9 during 2000 indicate the following:

- The most notable trend indicated by the sampling of the onsite monitoring wells was the continued increase in vinyl chloride concentrations at 3 monitoring wells at Site 9 (MW-NASB-069, MW-NASB-076, and MW-NASB-080). These wells are located within the central portion of Site 9, and have shown increases in vinyl chloride concentrations throughout the duration of the Long-Term Monitoring Program (1995-1999), with a spike in concentrations in 1999 and 2000. Monitoring wells outside this central portion of Site 9 generally show steady non-detections of vinyl chloride, or decreasing vinyl chloride concentrations.

- The breakdown of 1,2-dichloroethene to vinyl chloride in the central portion of Site 9 appears to be the reason for increasing concentrations of vinyl chloride at these monitoring wells. It is possible that favorable geochemical conditions exist in the vicinity of MW-NASB-069, which promotes dechlorination, thereby causing elevated concentrations of vinyl chloride at this sampling location. The decrease in vinyl chloride concentrations at MW-NASB-076 (located downgradient of MW-NASB-069) may be the result of volatilization and natural attenuation of vinyl chloride as ground water moves through the unconsolidated aquifer. Although the specific reason for the increase in vinyl chloride concentrations cannot be identified conclusively, non-detections for vinyl chloride are noted at monitoring wells near the impoundment ponds (MW-NASB-072, MW-NASB-074, and MW-NASB-075) indicating vinyl chloride is being naturally attenuated to nominal concentrations.

- Data results suggest dechlorination of 1,2-DCE into vinyl chloride has accelerated during 2000 at Site 9, as illustrated by the following observations:

  — The ratio of vinyl chloride to 1,2-DCE is increasing at the majority of locations where these compounds were detected (Figure 2-2). However, these data should be considered general trend indicators for dechlorination because calculation of the vinyl chloride to 1,2-DCE ratio is sensitive to a number of factors, including the low concentrations of vinyl chloride and 1,2-DCE that have been reported at Site 9, the variability that may be present due to laboratory methods, and the significant scatter of the site data. Despite these sensitive factors, the overall continued increasing ratios

in the wells with the highest detected concentrations at Site 9 indicate dechlorination is occurring at Site 9.

- The sum of the concentrations of vinyl chloride and 1,2-DCE in all study area wells are increasing at a similar rate as shown on Figure 2-3. Regression lines through these data points are similar for total 1,2-dichloroethene and vinyl chloride. The increasing trend for parent and daughter compounds based on data collected between 1995 and 2000 strongly suggest that the increase in vinyl chloride is related to the increase in 1,2-DCE concentrations. Dechlorination of 1,2-dichloroethene and the subsequent formation of vinyl chloride appears to be occurring at a similar rate. The source of contamination at Site 9 has not been determined. The changing geochemical conditions related to the Navy Exchange Service Station do appear important and likely have aided degradation of 1,2-DCE at Site 9. Based on long-term monitoring data, the increase in 1,2-DCE concentrations appears to be limited to the ground water present in the central portion of Site 9.

- Ground water moving onto Site 9 from the west (i.e., from the area near MW-NASB-227) does not appear to be contributing significant concentrations of VOCs to Site 9. Ground water that originates from the area to the west of Site 9 does not appear to be moving toward wells with the highest concentrations of vinyl chloride (MW-NASB-069). Based on these observations, a significant source of 1,2-DCE at the western boundary of Site 9 no longer appears to be likely.

- Spikes in VOCs and vinyl chloride concentrations followed by decreasing concentrations have been observed in samples from site wells throughout the Long-Term Monitoring Program (Figure 2-1). Similar patterns are expected to continue.

- Based on ground-water data collected during 2000, the vinyl chloride plume at Site 9 is limited to the central portion of the site. Monitoring wells in the long-term monitoring network appear to be well positioned to assess changes in vinyl chloride concentrations north of the impoundment ponds. Therefore, if elevated concentrations of vinyl chloride were to occur in areas downgradient of MW-NASB-069, the existing monitoring well network is likely to effectively track changes in ground-water concentrations of VOCs.

Inorganic Concentrations

The results of the ground-water sampling and analysis program conducted at Site 9 during 2000 indicate the following:

- Results of samples from the portion of Site 9 downgradient of the landfill reported elevated concentrations of iron above the Federal MCL in MW-NASB-069 (duplicate) and MW-NASB-079 in September 2000; manganese above the corresponding MEG

and/or secondary MCL at wells MW-NASB-069, MW-NASB-070, and MW-NASB-079 in April and September 2000; and thallium above the corresponding MEG and secondary MCL at wells MW-NASB-069 and MW-NASB-079 in April 2000. No other inorganic elements were detected in excess of MEGs and/or MCLs.

3.1.3 Surface Water Sampling Program

Results of the surface water sampling and analysis program conducted during 2000 indicate the following:

- Concentrations of 1,2-DCE and vinyl chloride were detected in surface water sample SW-010 collected from the northern branch of the unnamed stream in September 2000; 1,2-DCE was reported at an estimated concentration because it was identified below the detection limit. Vinyl chloride was detected in the sample collected from the unnamed stream (SW-010) during one event in 2000. However, the result was estimated because it was identified below the detection limit. These results are likely the result of ground water from Site 9 discharging to the unnamed stream, as indicated in site ground-water flow patterns (Figures 2-1 and 2-2). Concentrations of VOCs at this sampling location are approximately two orders of magnitude below ground-water concentrations measured upgradient (MW-NASB-069), and lower than concentrations measured at the closest monitoring well (MW-NASB-076). The decrease in VOCs at the surface water sampling location is likely due to volatilization and dilution of VOCs in the unnamed stream.

3.1.4 Sediment Sampling Program

Results of the sediment sampling and analysis program conducted during 2000 indicate the following:

- Vinyl chloride was not detected in the sediment sample collected during Monitoring Event 16; 1,2-DCE was detected at a concentration of 17 µg/Kg during Monitoring Event 16.

3.1.5 Seep Sampling Program

Results of the seep sampling and analysis program conducted during 2000 indicate the following:

- There were no detected concentrations of vinyl chloride in the seep sample. Only acetone was reported in the seep samples collected at Site 9 in 2000.

3.1.6 Visual Inspection

Site inspections indicated no visual evidence of stressed vegetation in the vicinity of the site during the two inspection events. One stream gauge was found missing during the April 2000 monitoring event and replaced prior to the September 2000 sampling event. No well repairs were conducted at site wells, and no significant well integrity issues were observed.

3.2 RECOMMENDATIONS

Based on an analysis of the data collected at Site 9 as part of the Long-Term Monitoring Program, the following recommendations are made:

- Continue long-term monitoring and sampling during 2001 to assess the effectiveness of natural attenuation with long-term monitoring, the selected remedy for the site.

- Continue to collect bi-annual samples at long-term monitoring sample points in April and September.

- Expand the use of aqueous diffusion samplers to Site 9. Complete a pilot study for wells at Site 9 that are currently sampled only for VOCs (MW-NASB-071, MW-NASB-072, MW-NASB-074, MW-NASB-075, MW-NASB-076, MW-NASB-080, MW-NASB-022, and MW-NASB-227). The recommended design of the study should be similar to the one used for the second aqueous diffusion sampler pilot study at the Eastern Plume (i.e., three diffusion samplers installed in each well and collection of low-flow sample for comparison).

- Continue gauging of wells located at Site 9, upgradient wells, and monitoring wells at the Navy Exchange Service Station during 2001 to collect data on ground-water flow patterns.

- Continue to evaluate the possibility of a potential source of 1,2-DCE near MW-NASB-227 at the western boundary of Site 9. Data results collected during 2000 suggest that there may not be a source of 1,2-DCE to the west of MW-NASB-227. Data collected during 1999, however, suggested that there was a potential unidentified source of 1,2-DCE to the west of MW-NASB-227. Due to this discrepancy, further evaluation after additional sampling of MW-NASB-227 is recommended.

- Continue to obtain data to evaluate if the Navy Exchange Service Station is influencing ground-water geochemistry and ground-water flow patterns at Site 9.

- Reduce the number of parameters for laboratory analysis to reflect the fact that there were no reported concentrations of any SVOC analytes in any samples collected and analyzed during any of the monitoring events conducted in 1999 and 2000.

REFERENCES

ABB Environmental Services (ABB-ES). 1994. Final Long-Term Monitoring Plan, Building 95, Sites 1 and 3, and Eastern Plume. August.

EA Engineering, Science, and Technology. 1999a. Final Record of Decision. Site 9, Naval Air Station, Brunswick, Maine. September.

EA. 1999b. Final Long-Term Monitoring Plan. Site 9, Naval Air Station, Brunswick, Maine. August.

EA. 2000a. Monitoring Event 16 – April 2000. Site 9, Naval Air Station, Brunswick, Maine. June.

EA. 2000b. Monitoring Event 17 – September 2000. Site 9, Naval Air Station, Brunswick, Maine. November.

EA. 2000c. 1999 Annual Report – Site 9, Naval Air Station, Brunswick, Maine. May.

Appendix A

Analytical Trend Graphs
March 1995 – September-October 2000

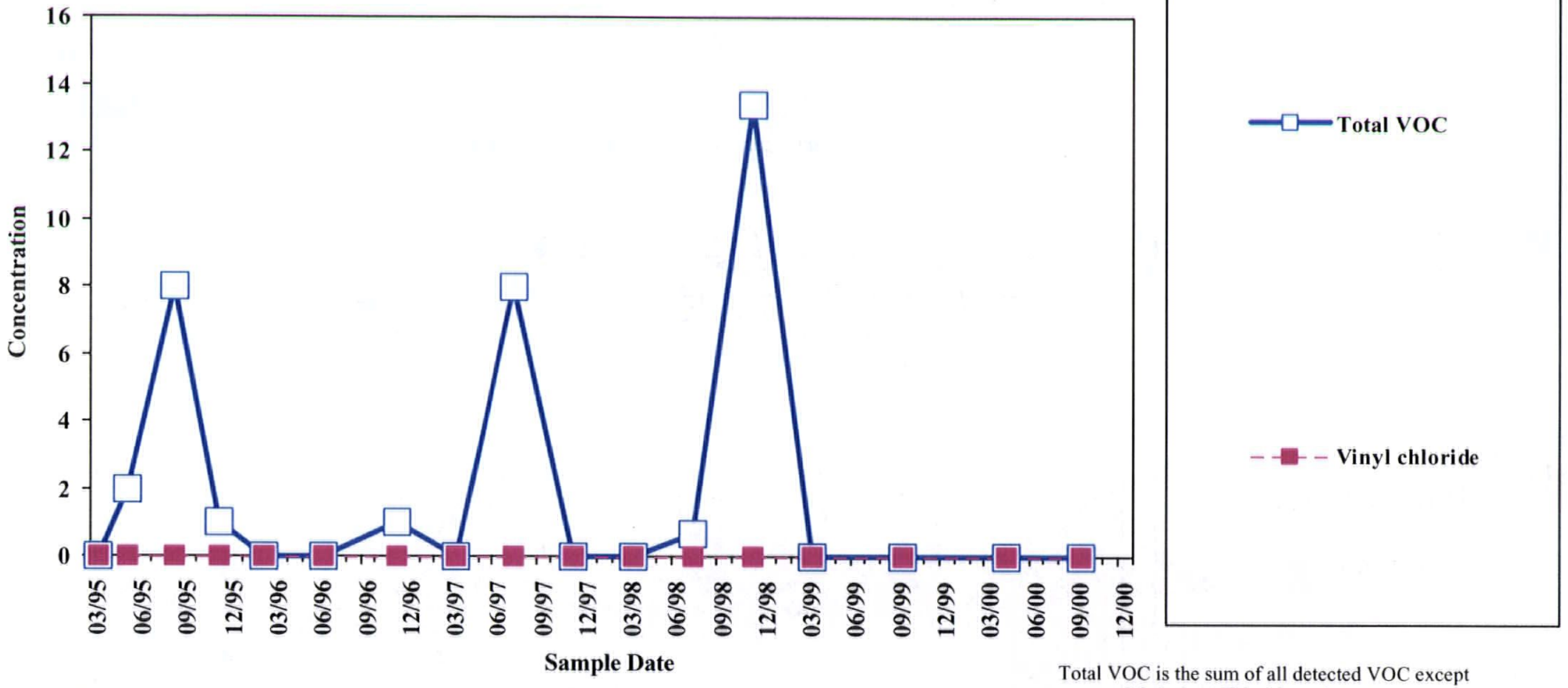
Sample Location:

LT-901

Site 9

Leachate

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

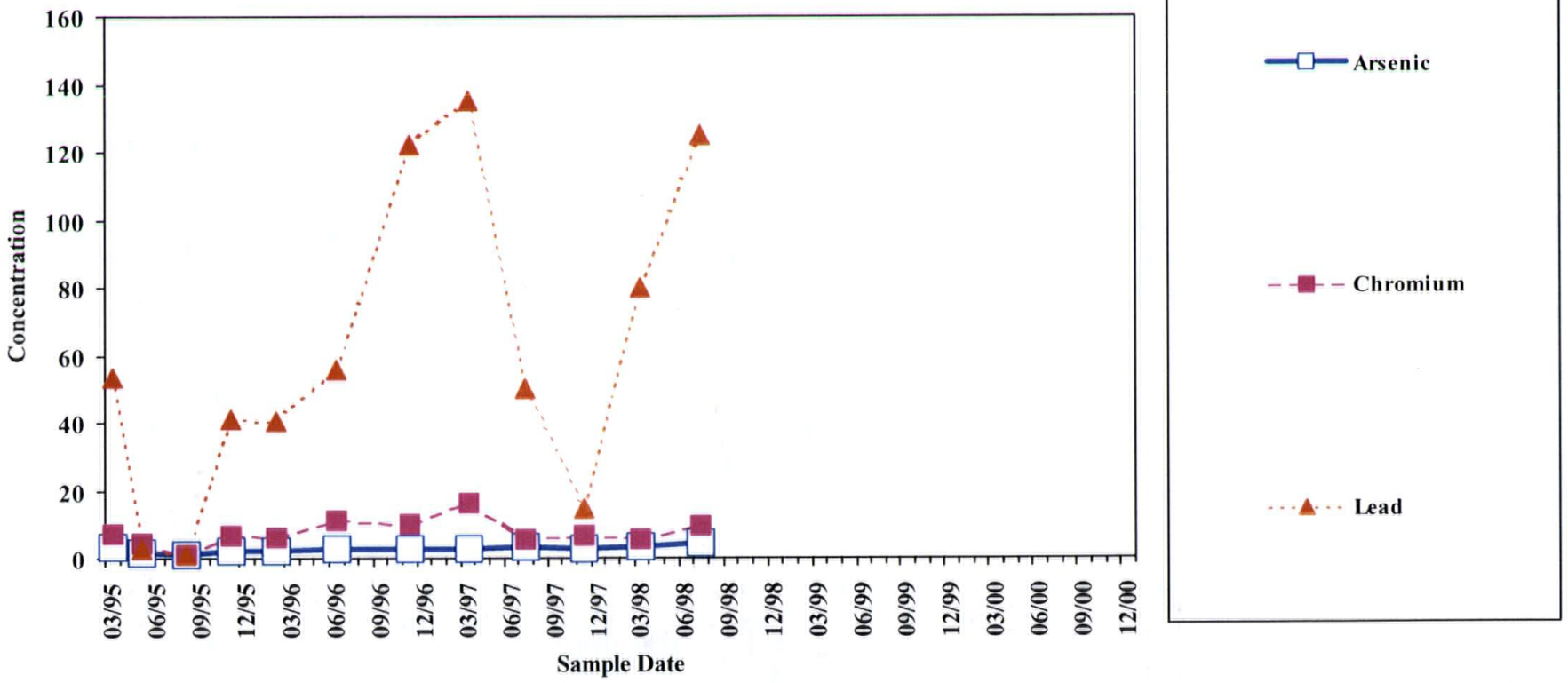
Sample Location:

LT-901

Site 9

Sediment

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: mg/Kg

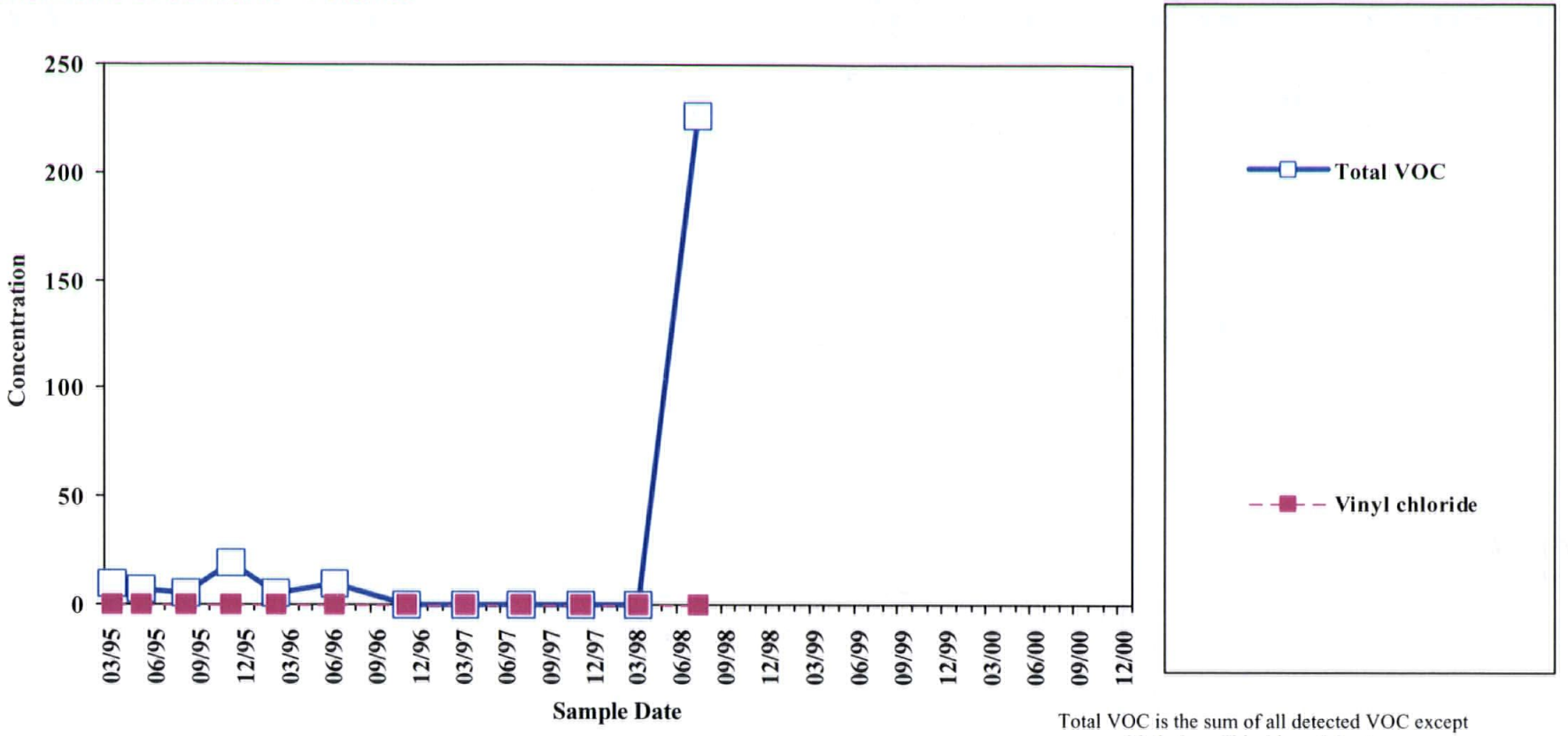
Sample Location:

LT-901

Site 9

Sediment

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/Kg

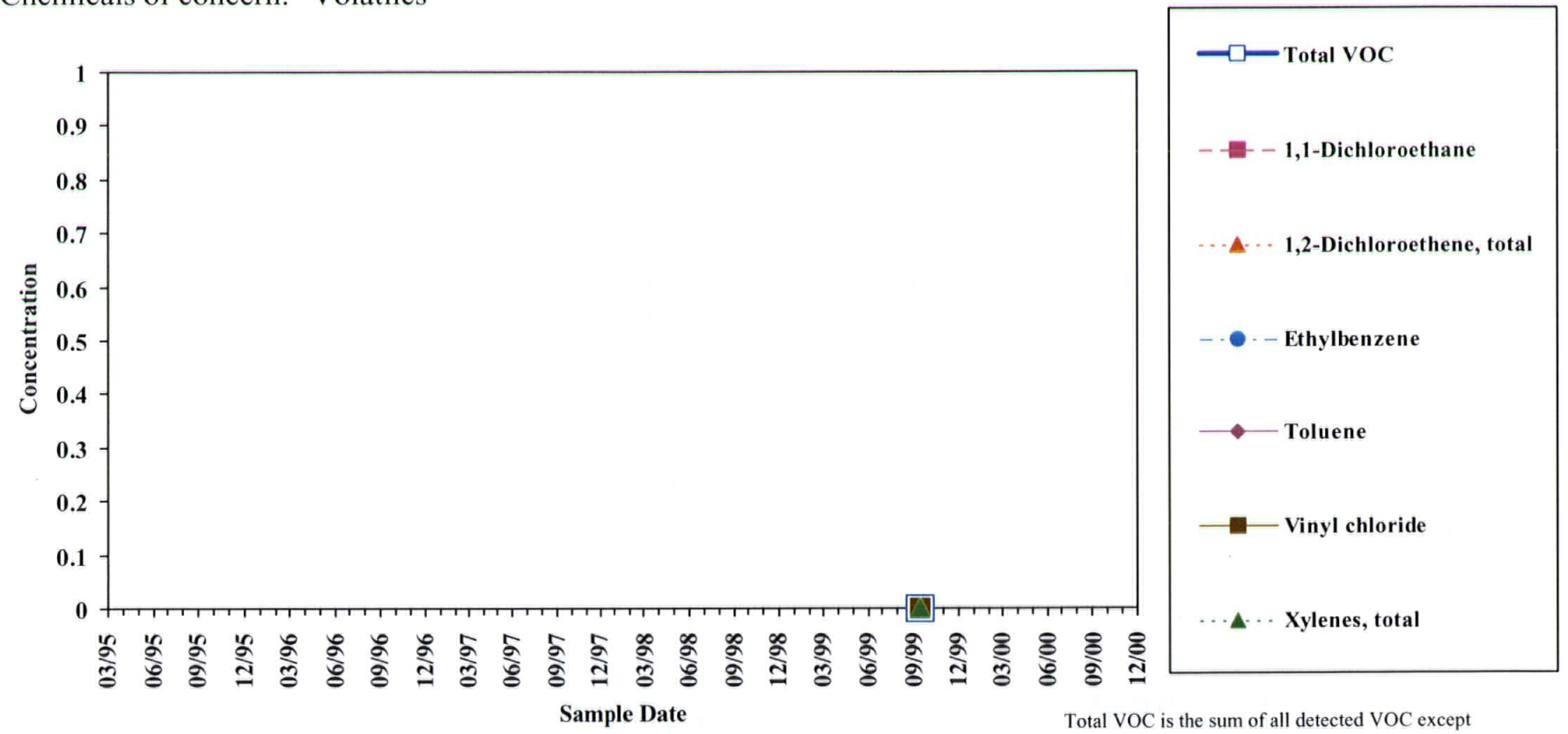
Sample Location:

MW-NASB-008

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

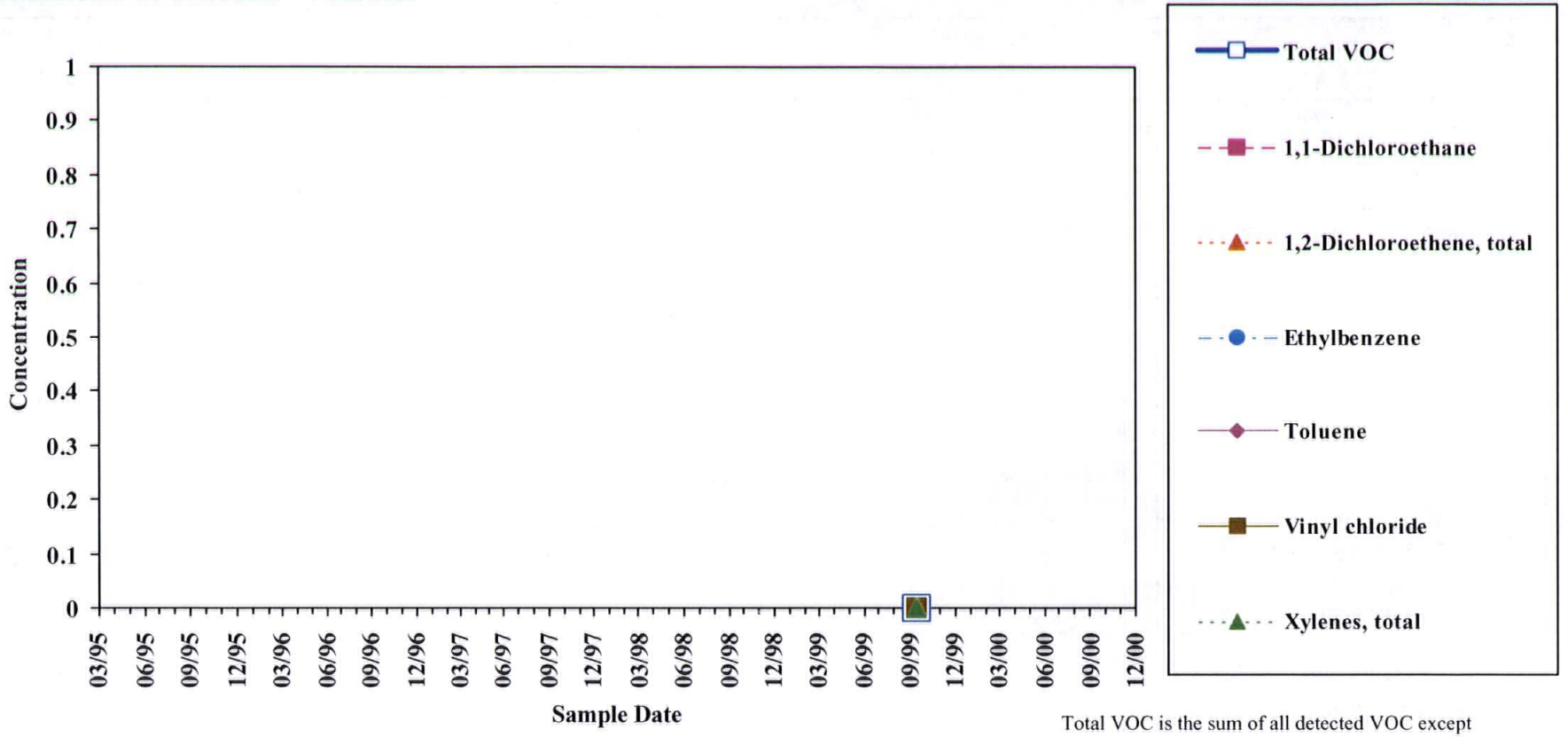
Sample Location:

MW-NASB-009

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

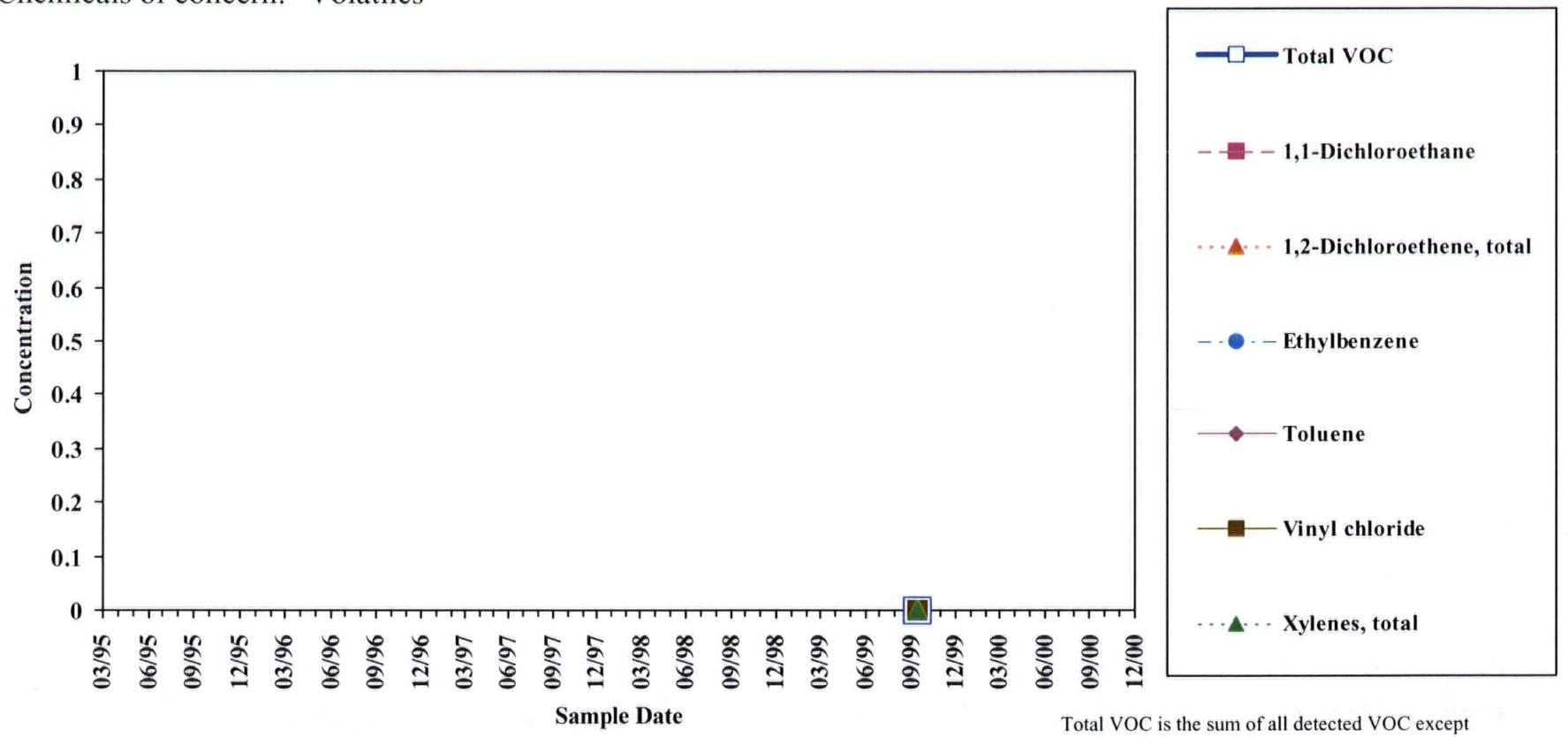
Sample Location:

MW-NASB-010

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

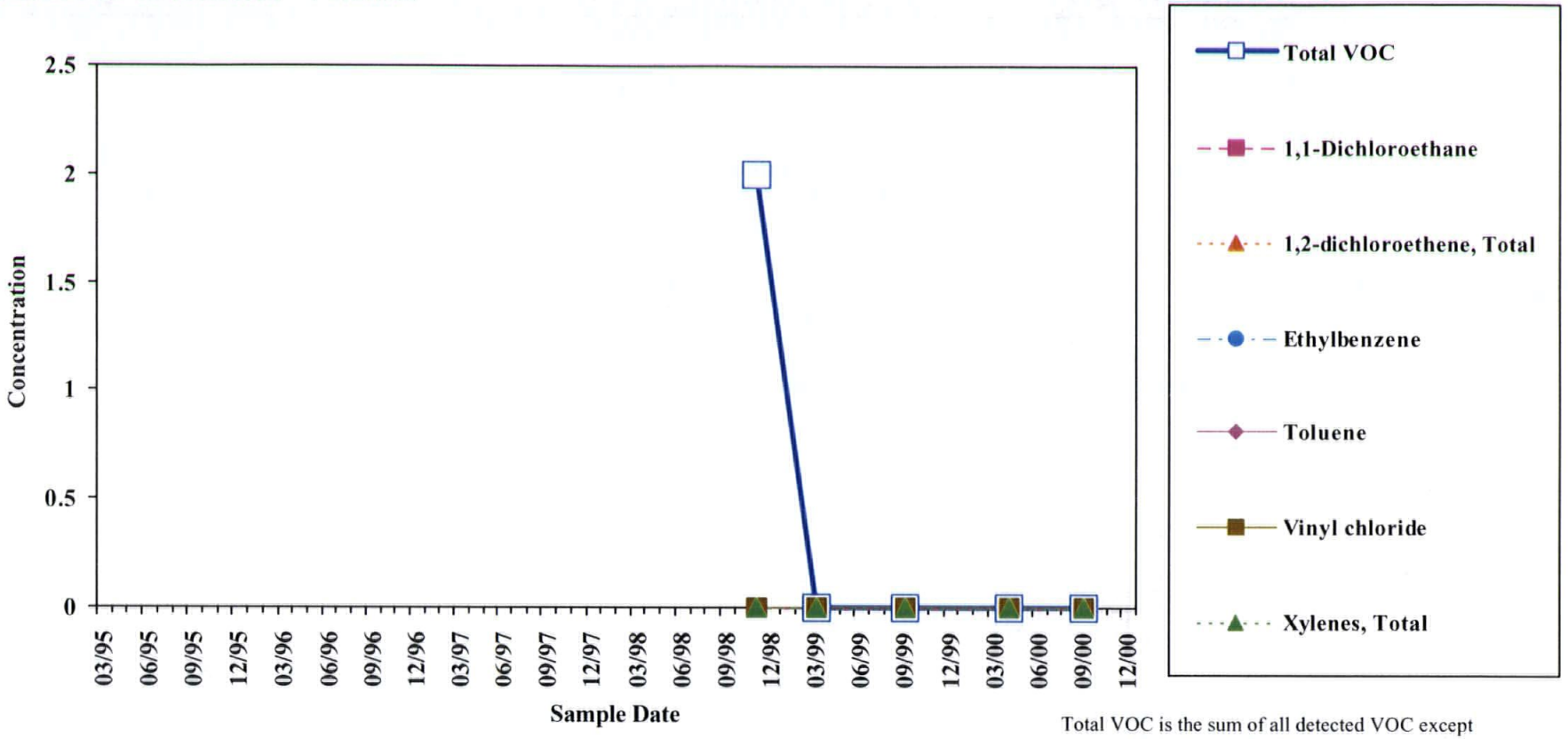
Sample Location:

MW-NASB-022

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

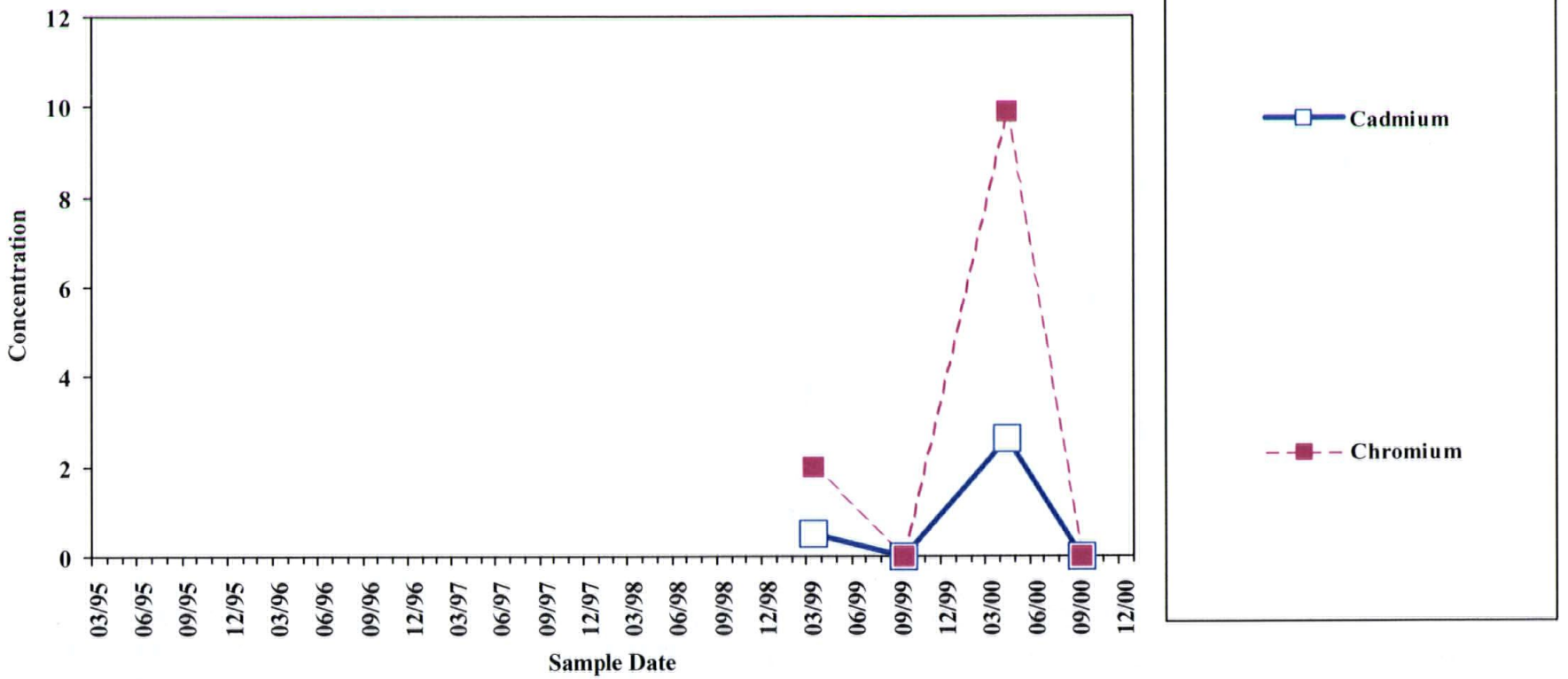
Sample Location:

MW-NASB-069

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

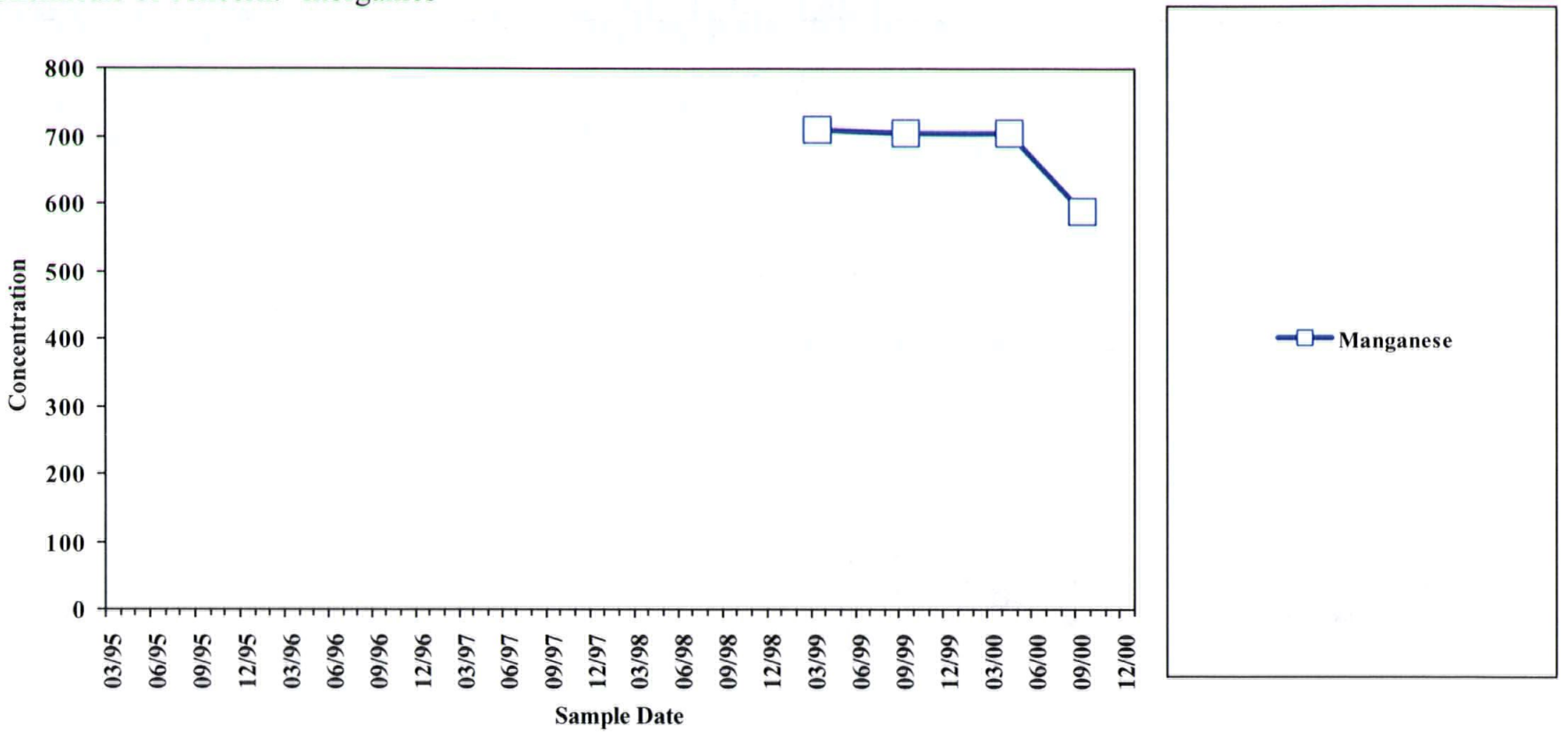
Sample Location:

MW-NASB-069

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

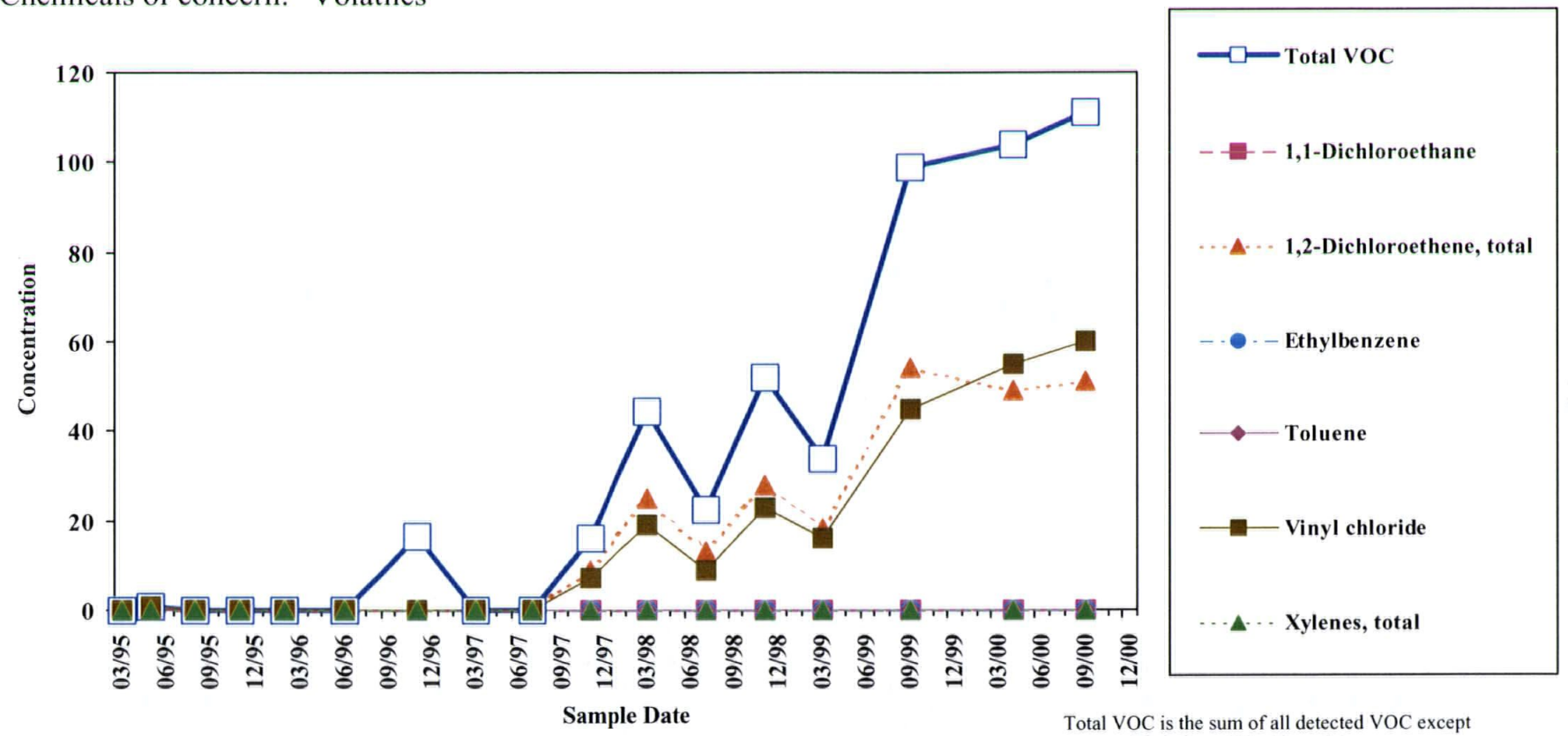
Sample Location:

MW-NASB-069

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

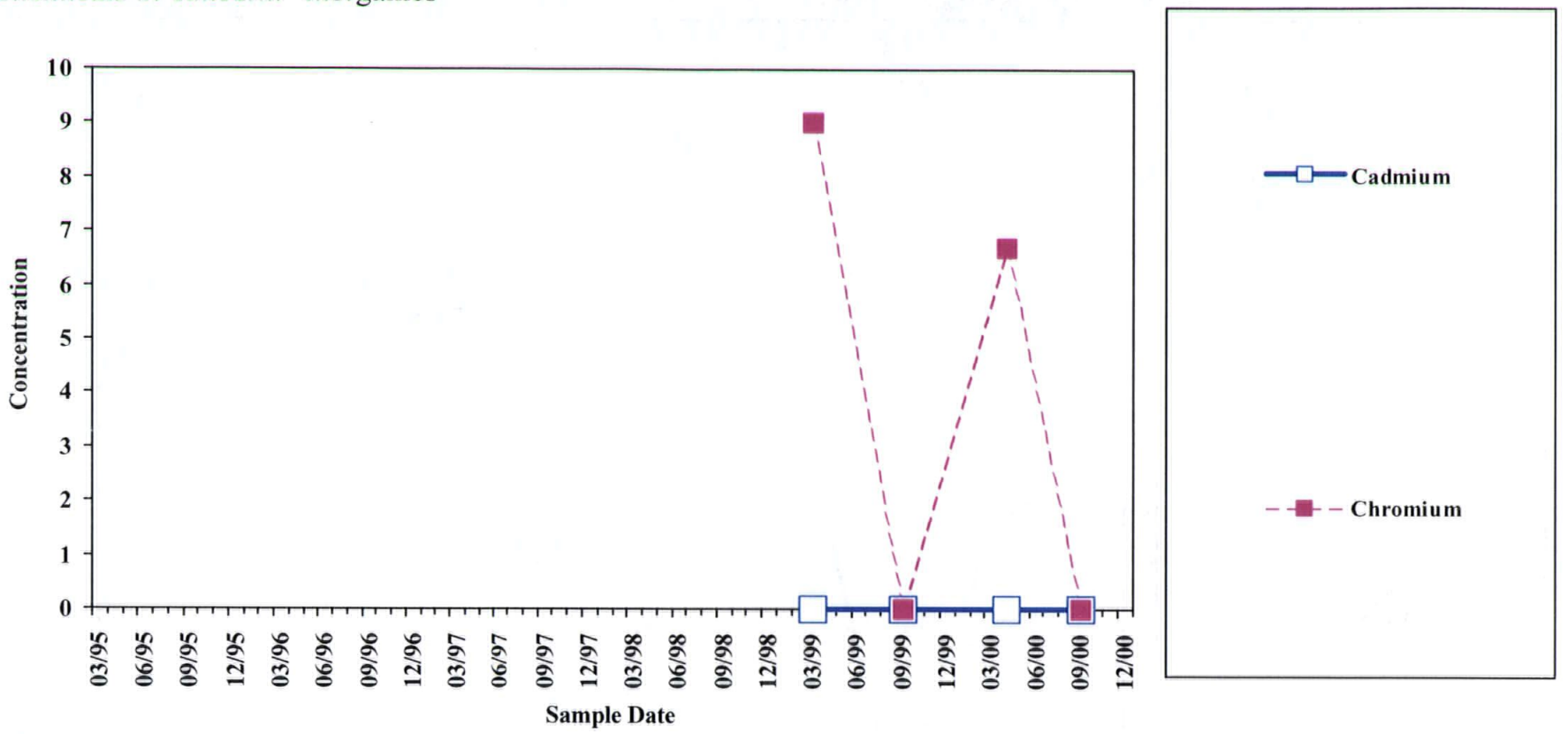
Sample Location:

MW-NASB-070

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

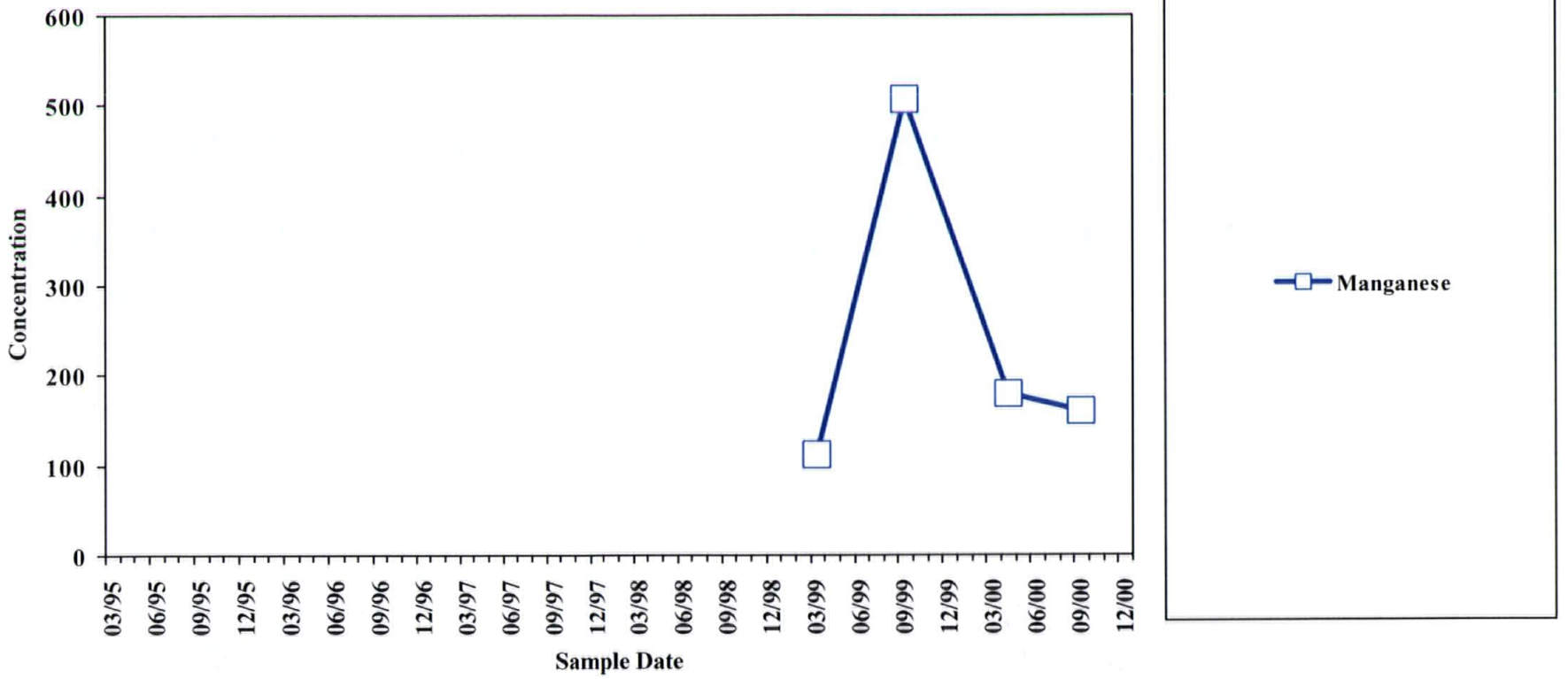
Sample Location:

MW-NASB-070

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

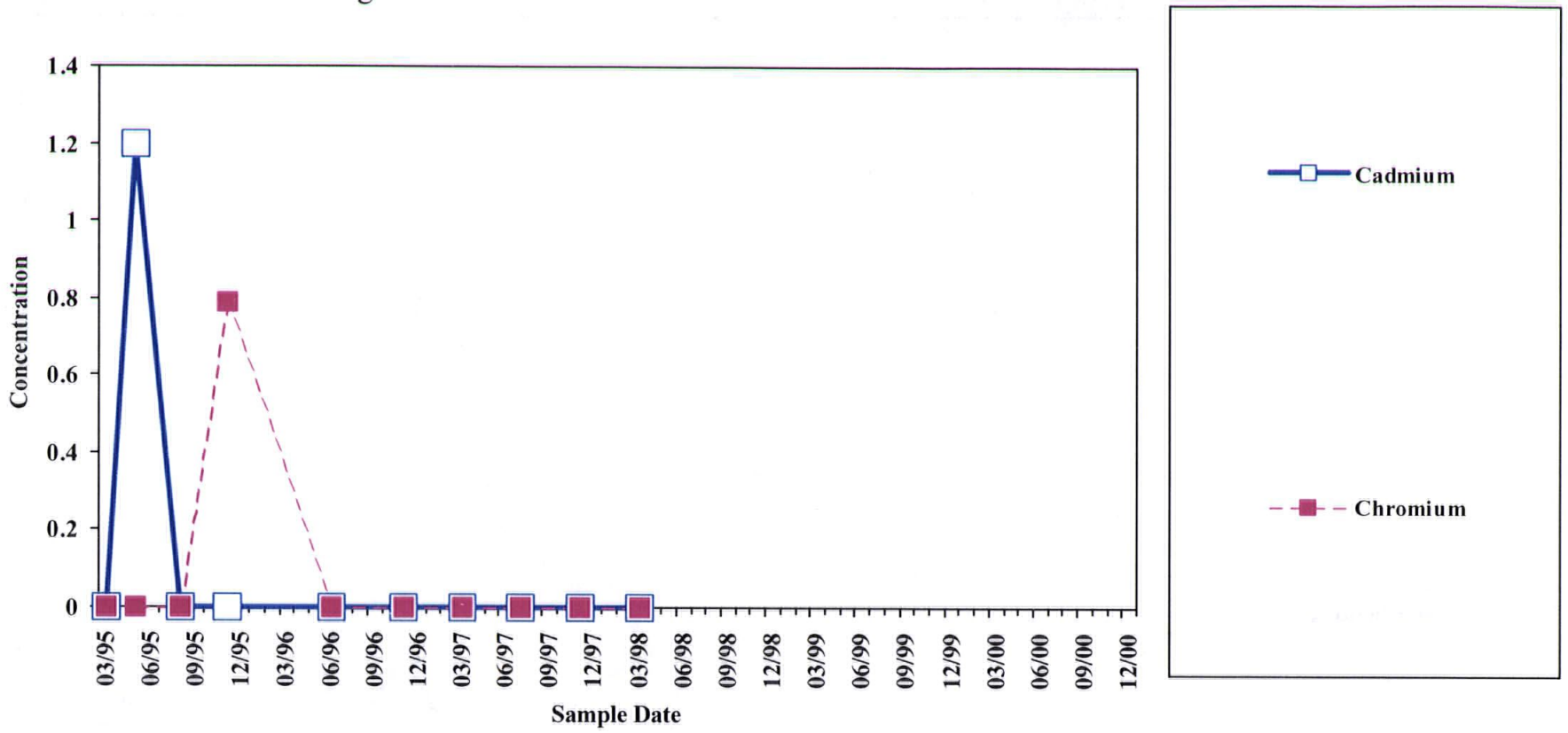
Sample Location:

MW-NASB-071

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

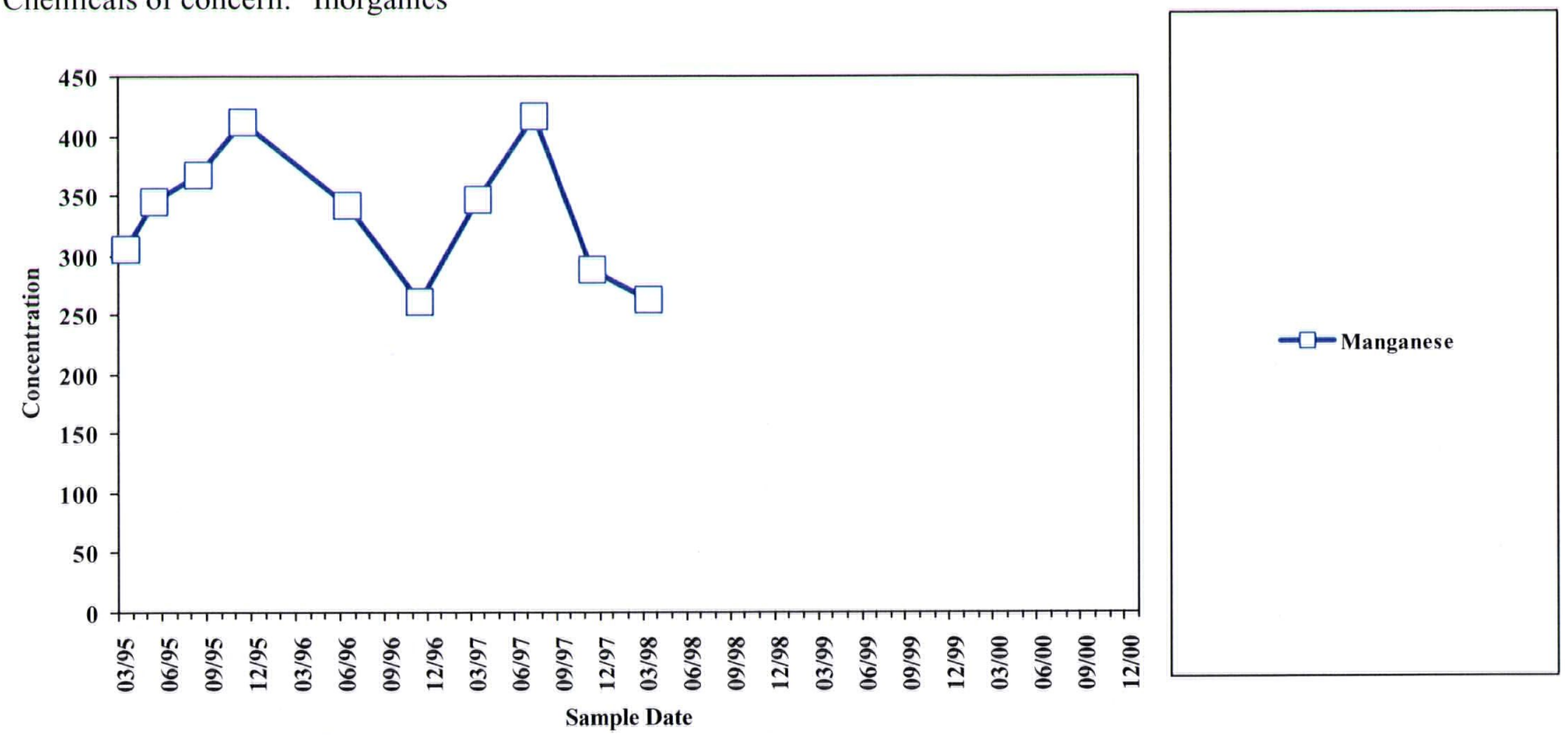
Sample Location:

MW-NASB-071

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

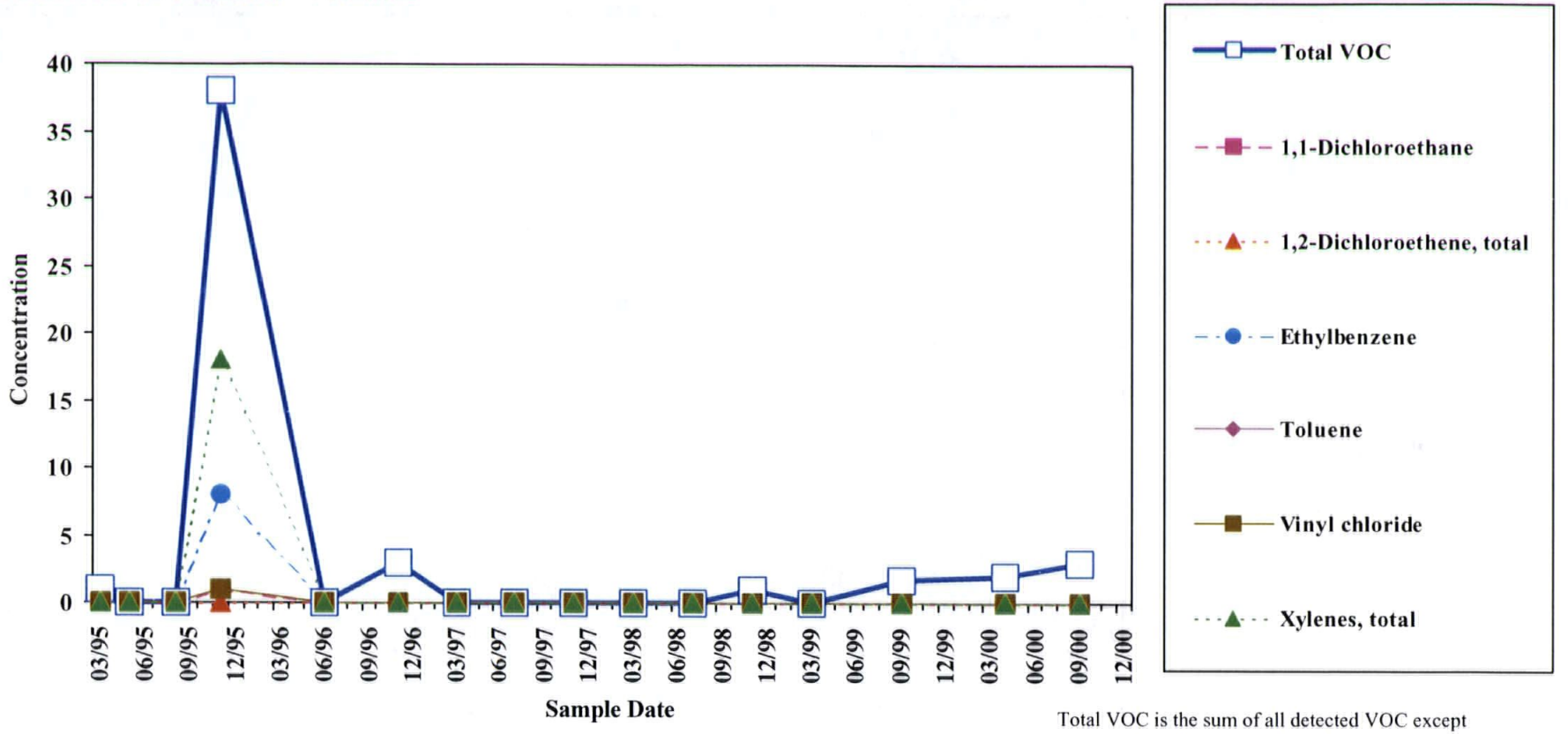
Sample Location:

MW-NASB-071

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

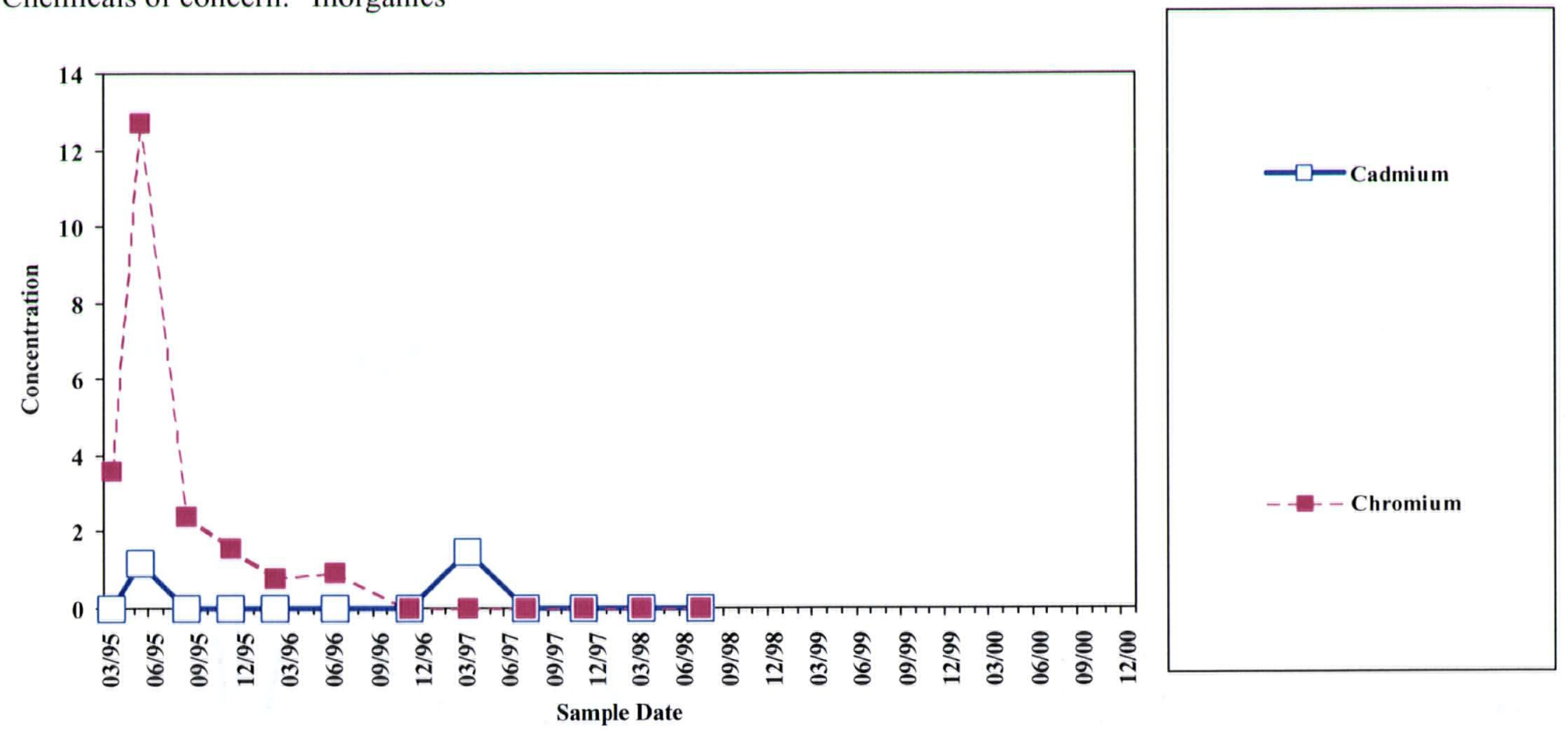
Sample Location:

MW-NASB-072

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

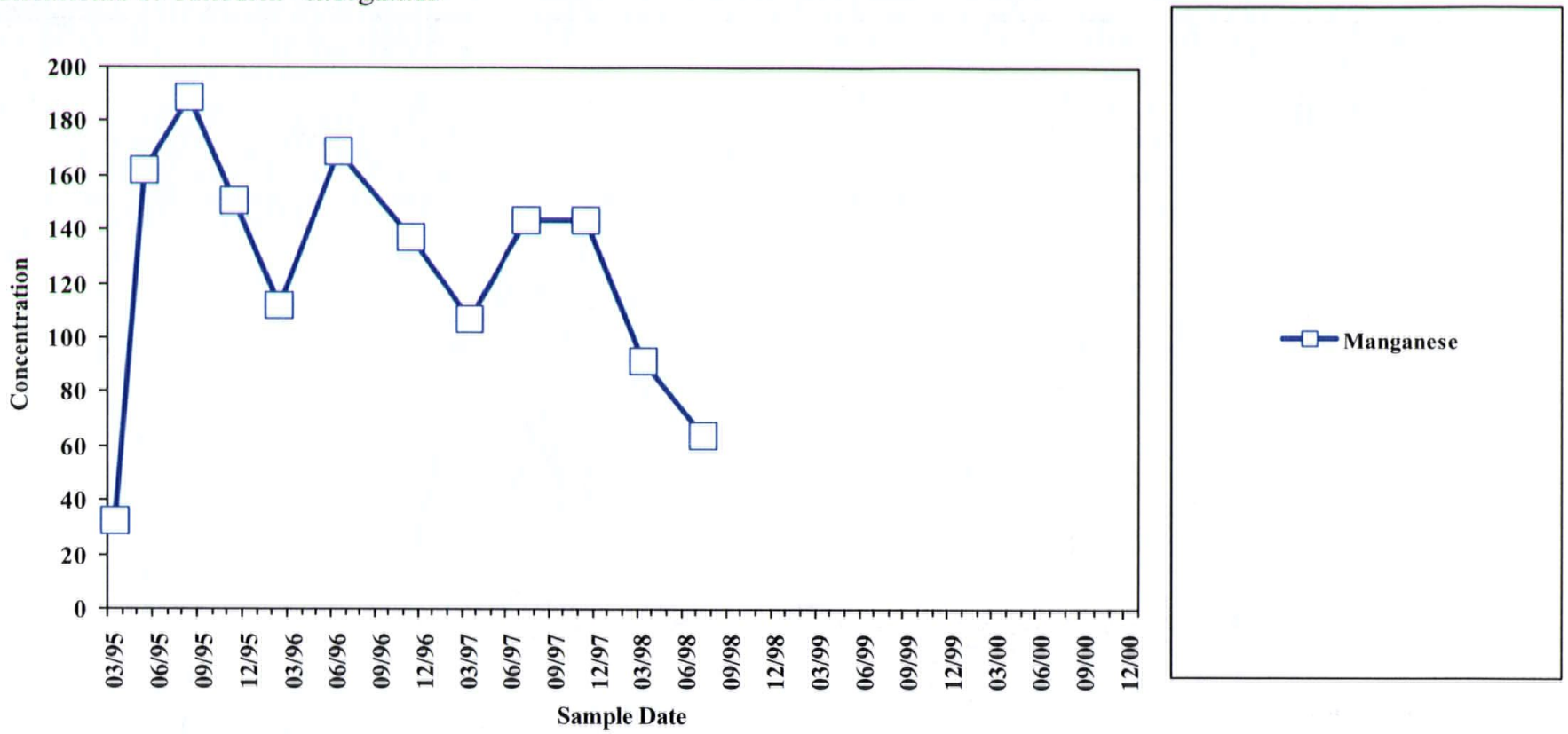
Sample Location:

MW-NASB-072

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

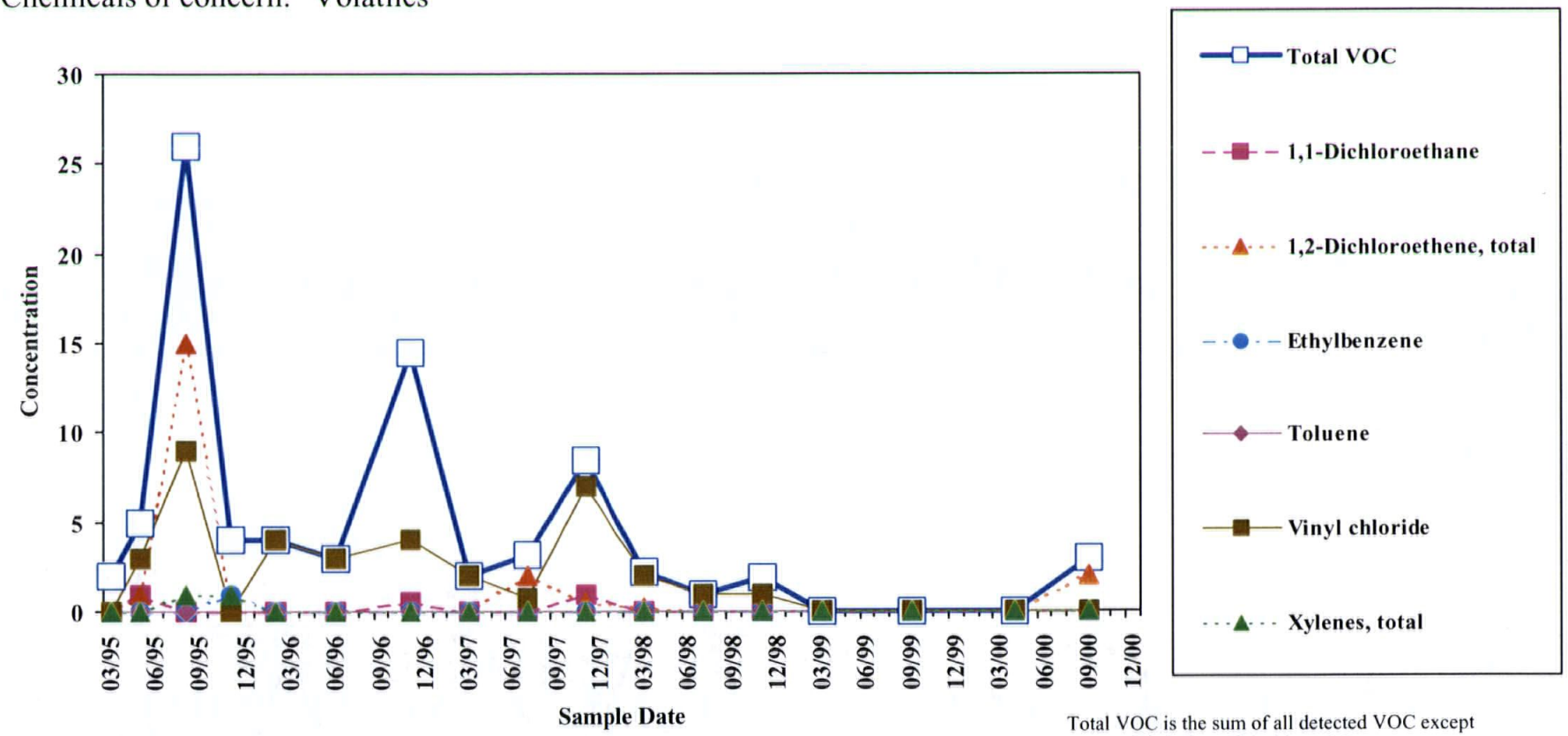
Sample Location:

MW-NASB-072

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

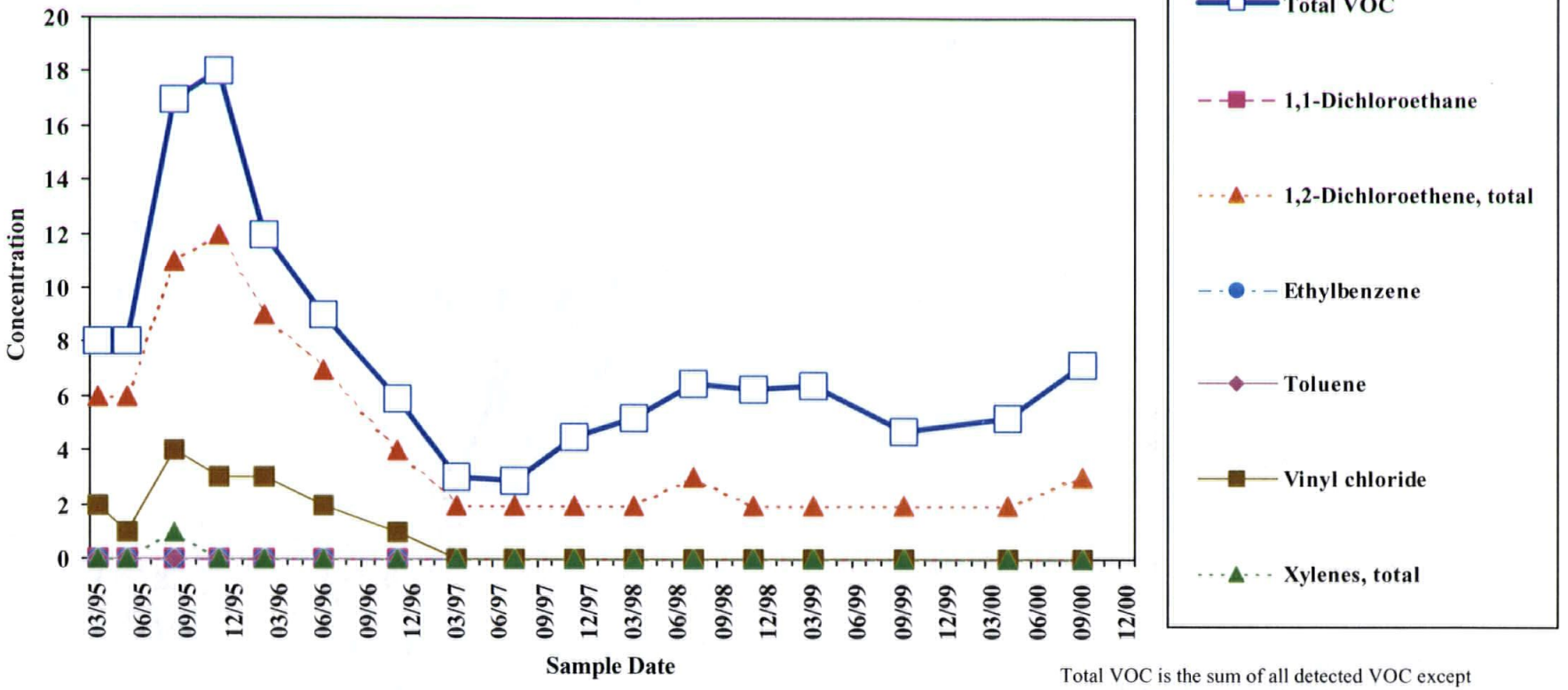
Sample Location:

MW-NASB-074

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

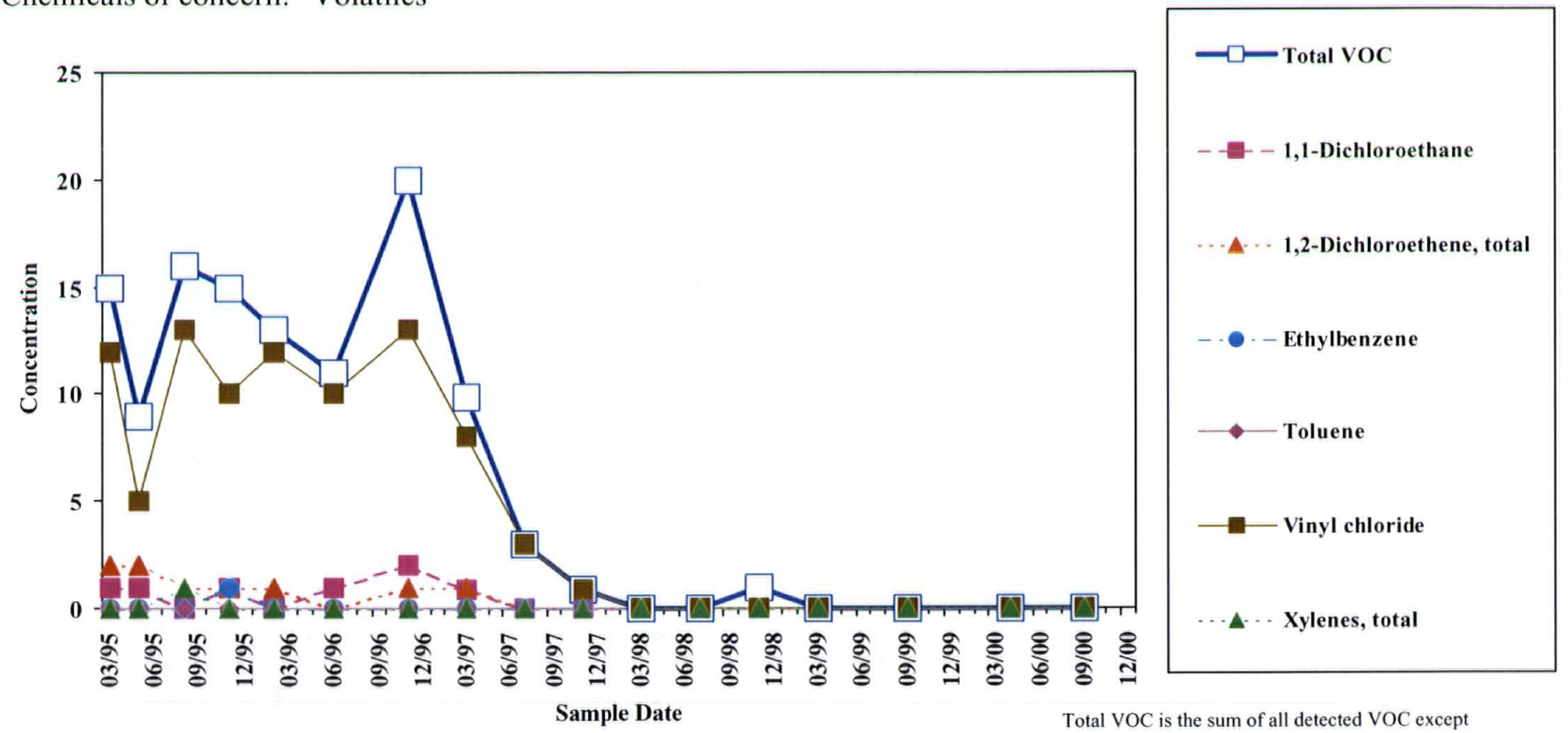
Sample Location:

MW-NASB-075

Site 9

Ground Water

Chemicals of concern: Volatiles



Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

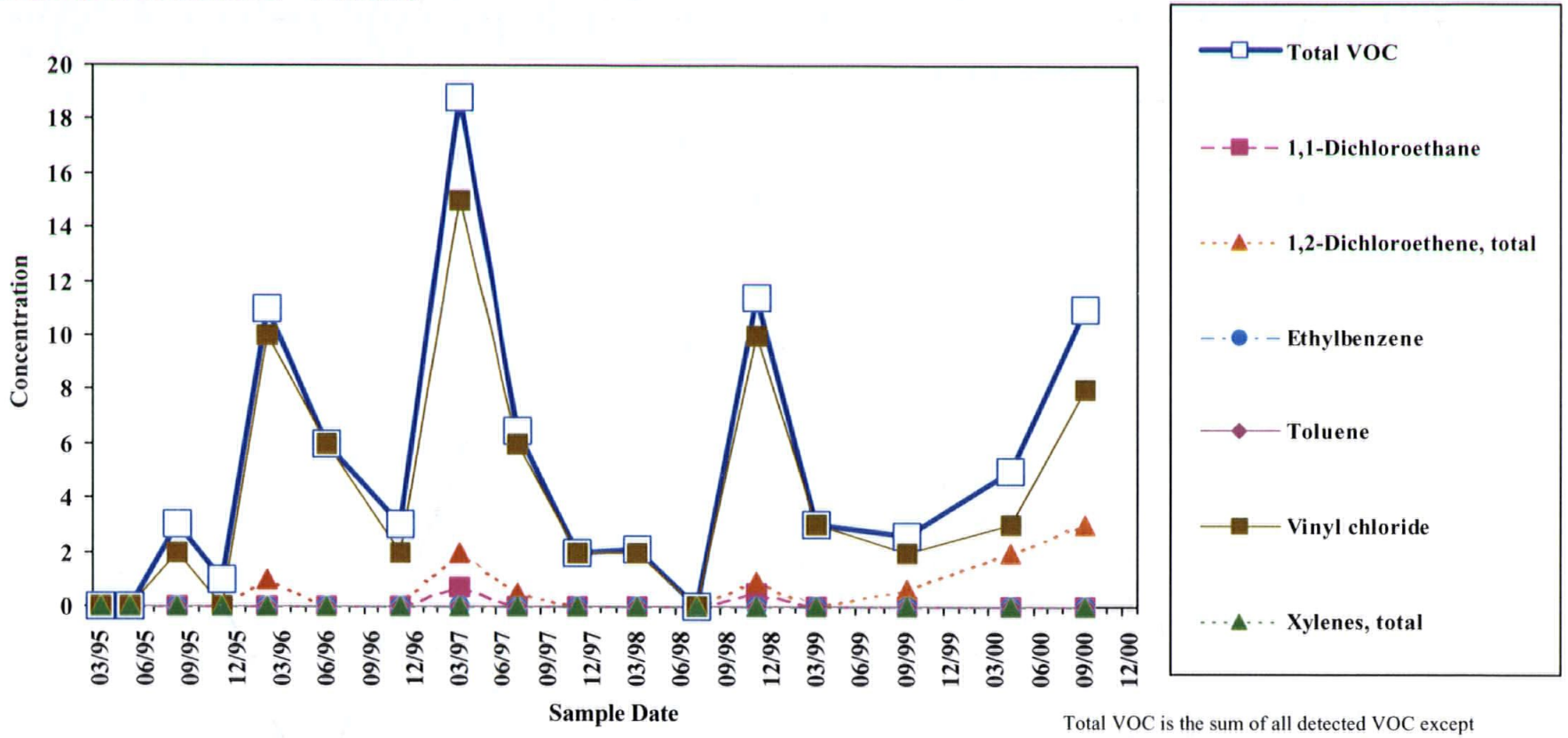
Sample Location:

MW-NASB-076

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

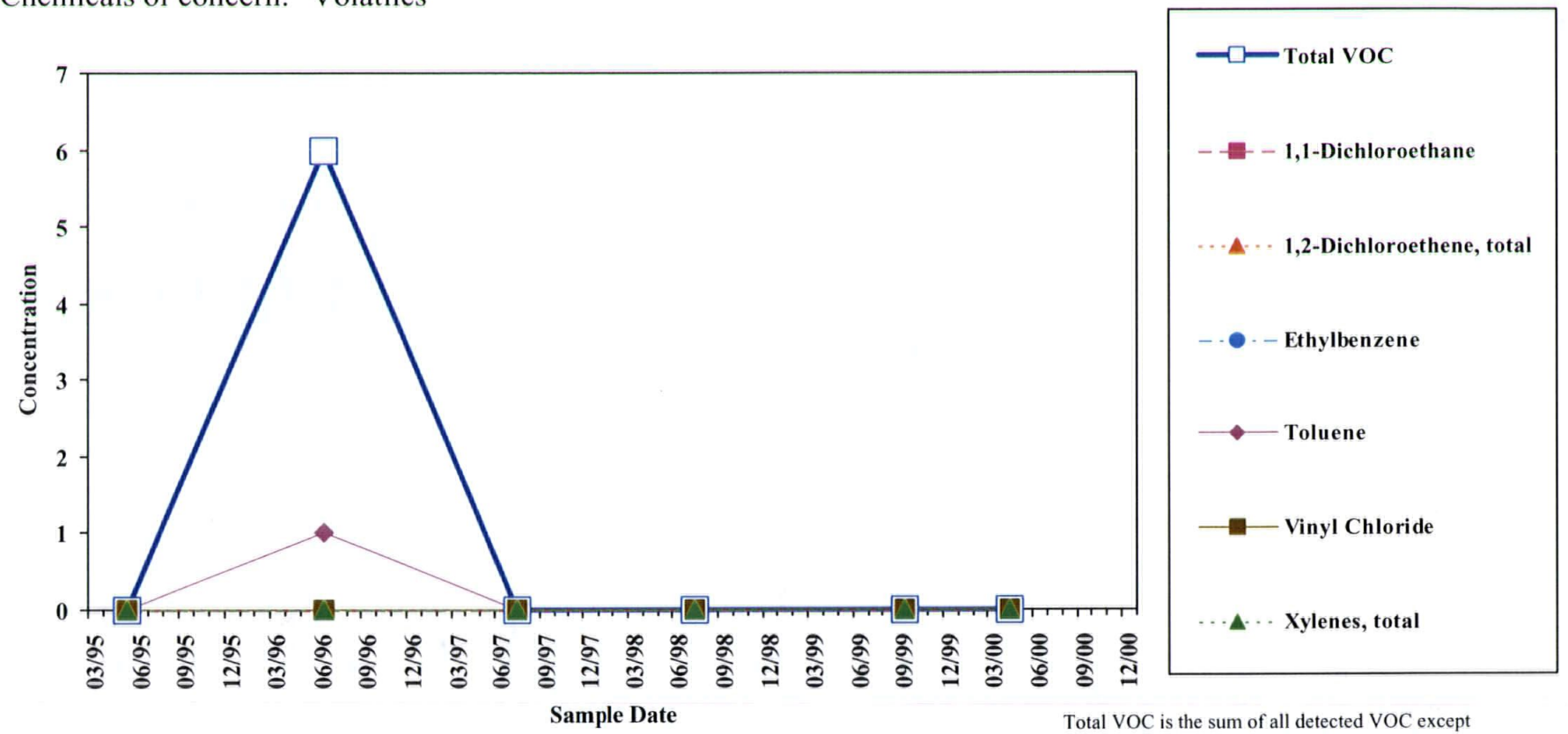
Sample Location:

MW-NASB-077

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

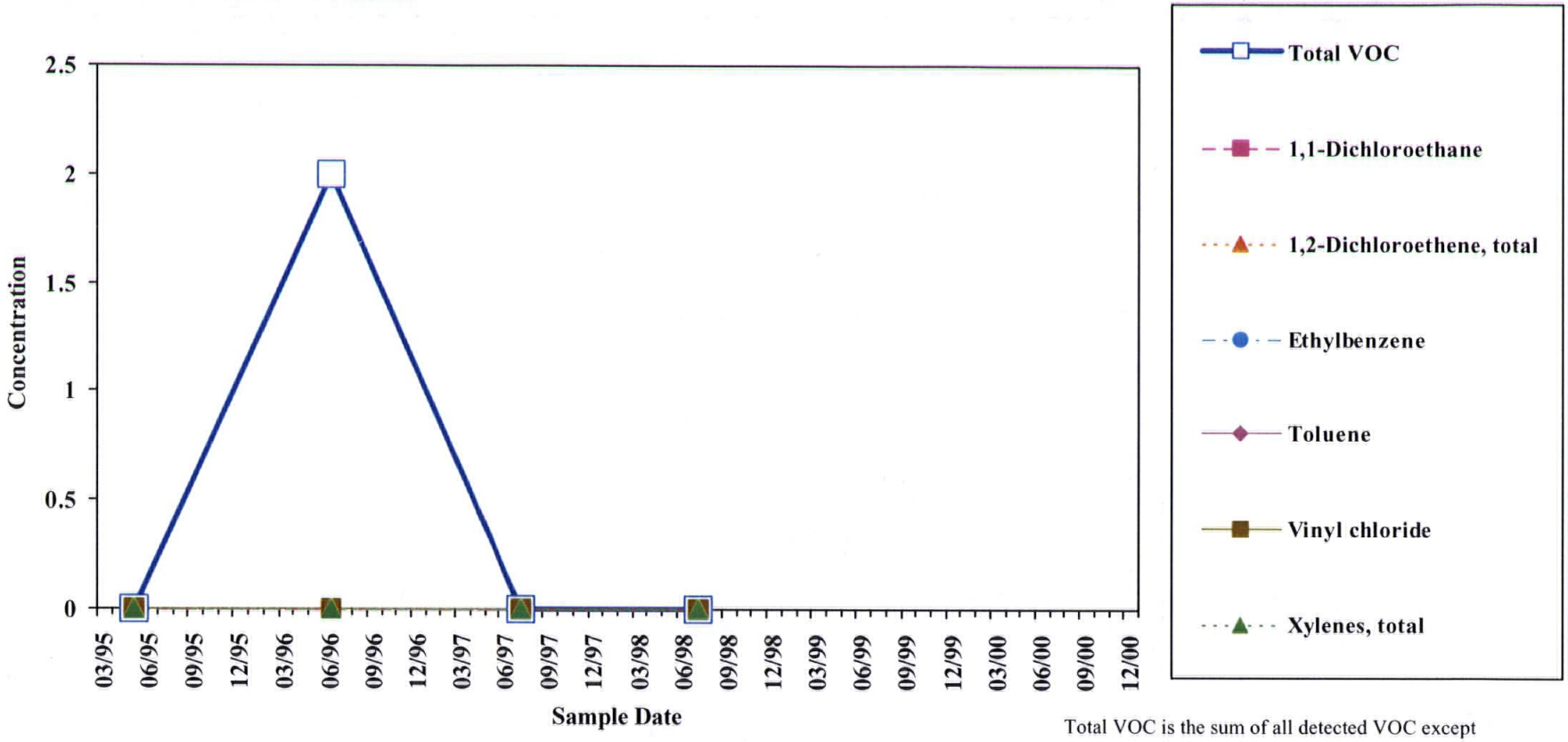
Sample Location:

MW-NASB-078

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

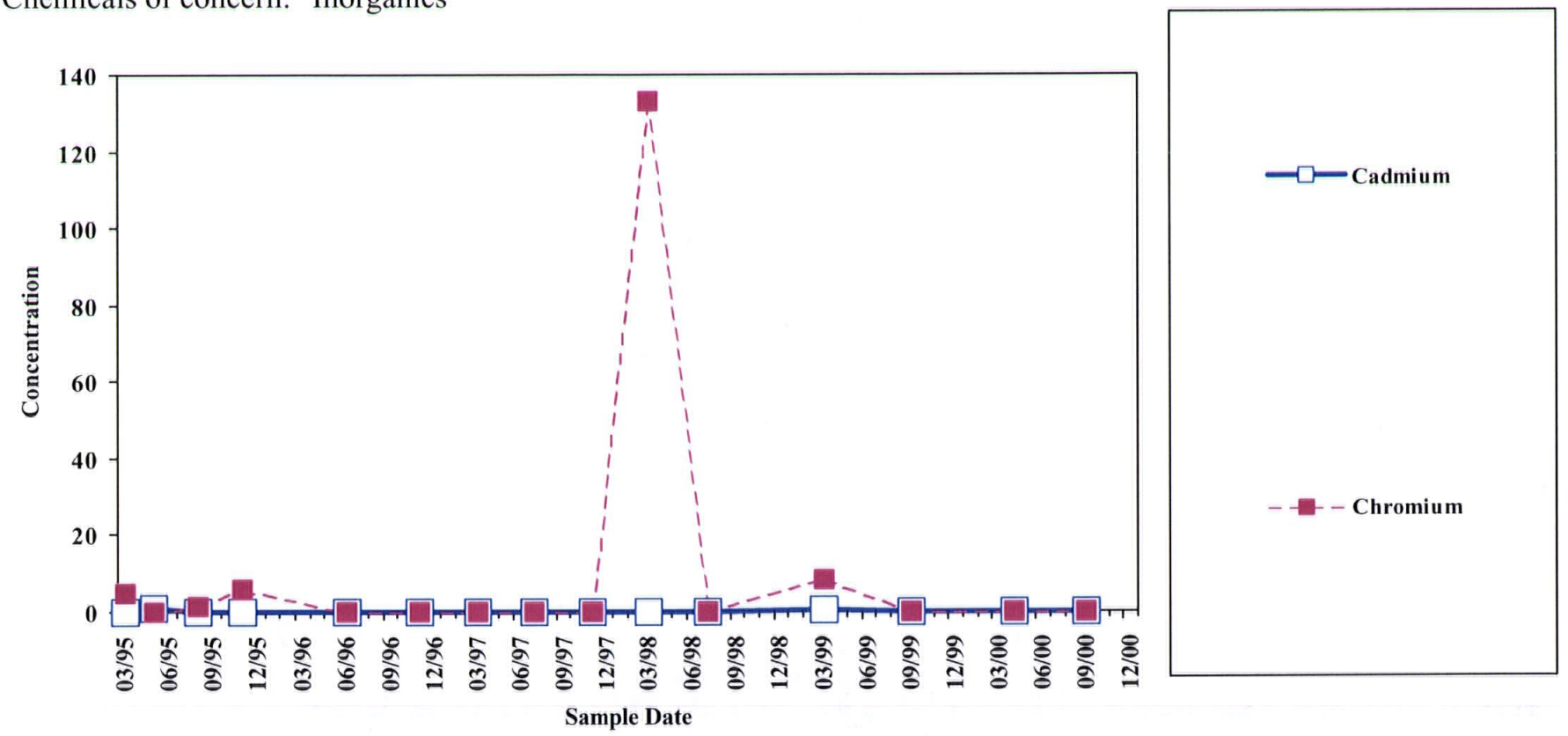
Sample Location:

MW-NASB-079

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

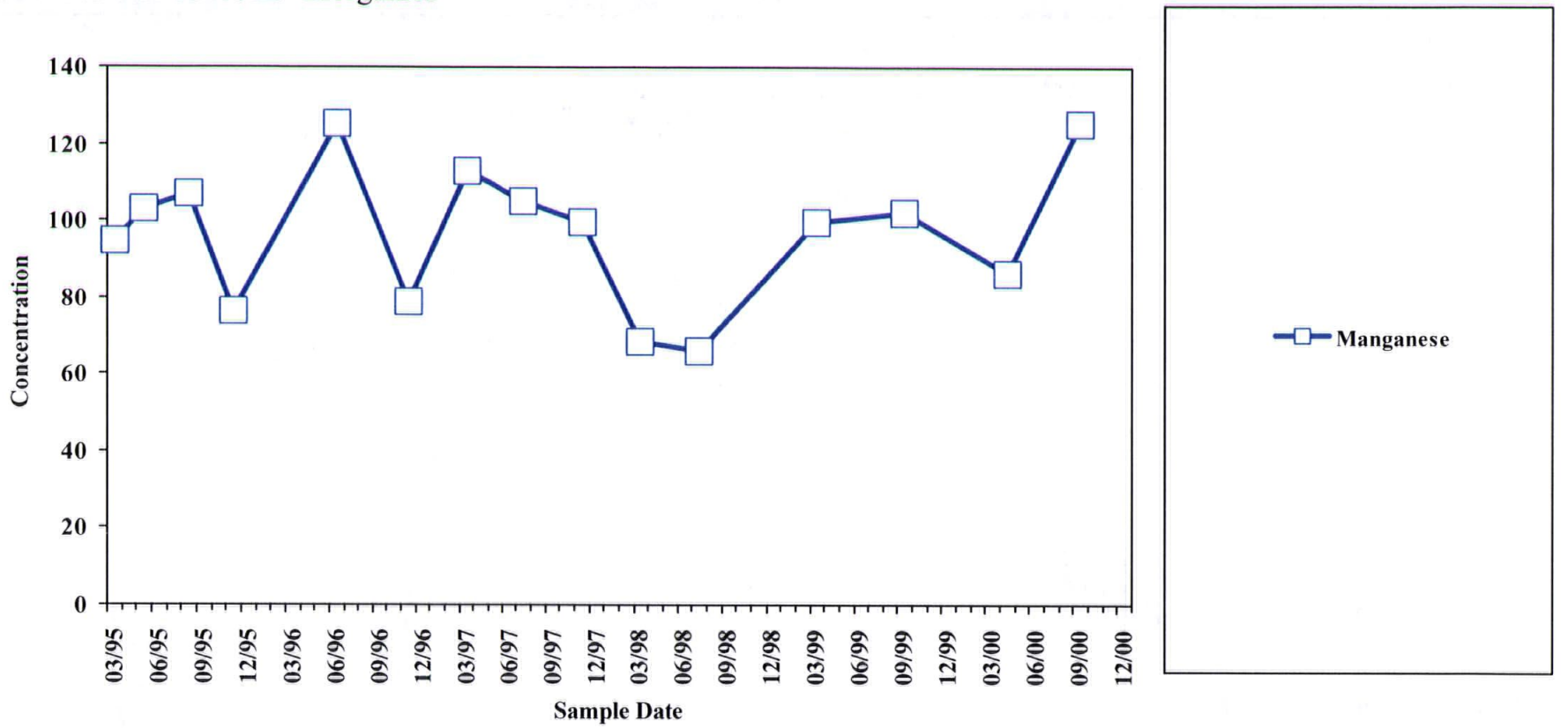
Sample Location:

MW-NASB-079

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

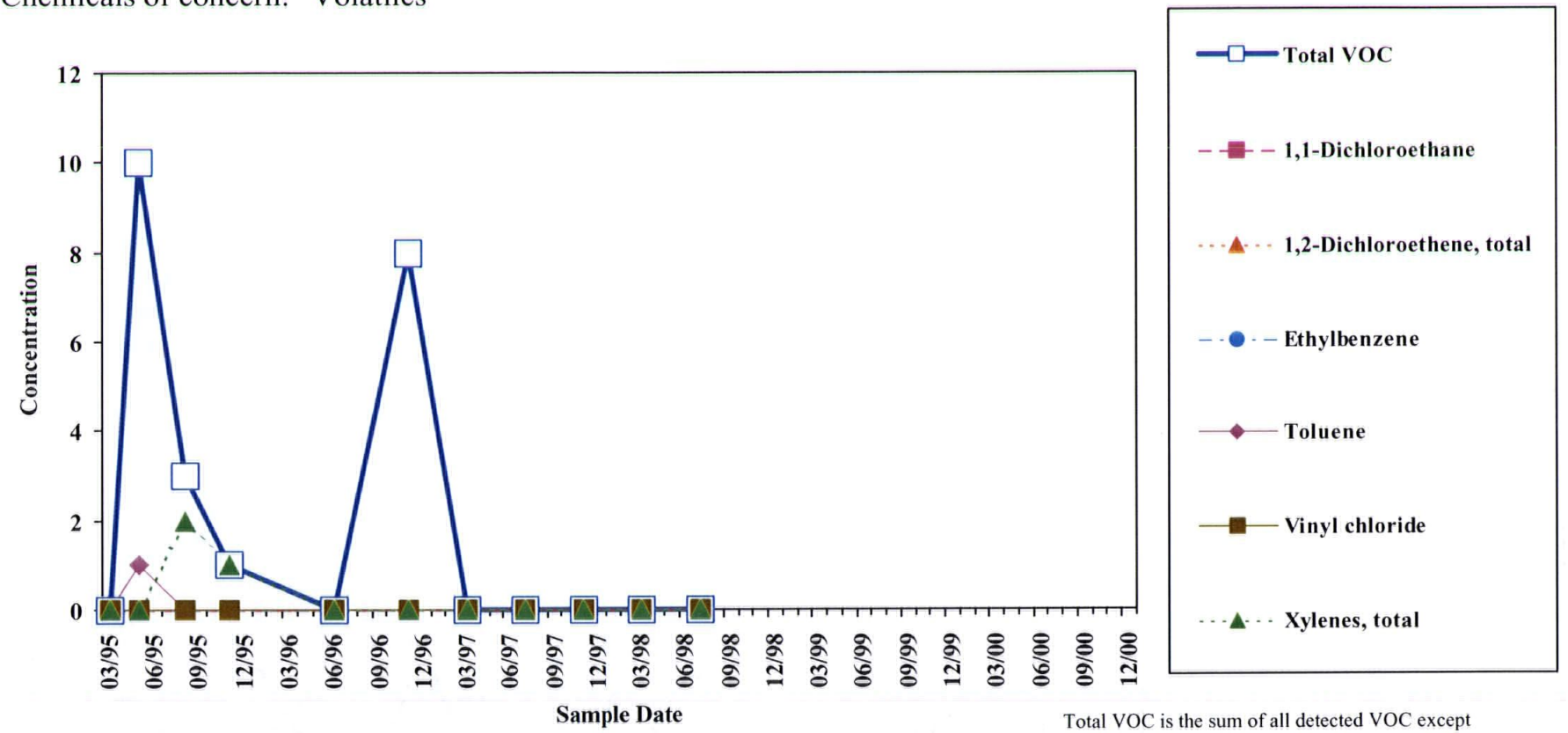
Sample Location:

MW-NASB-079

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

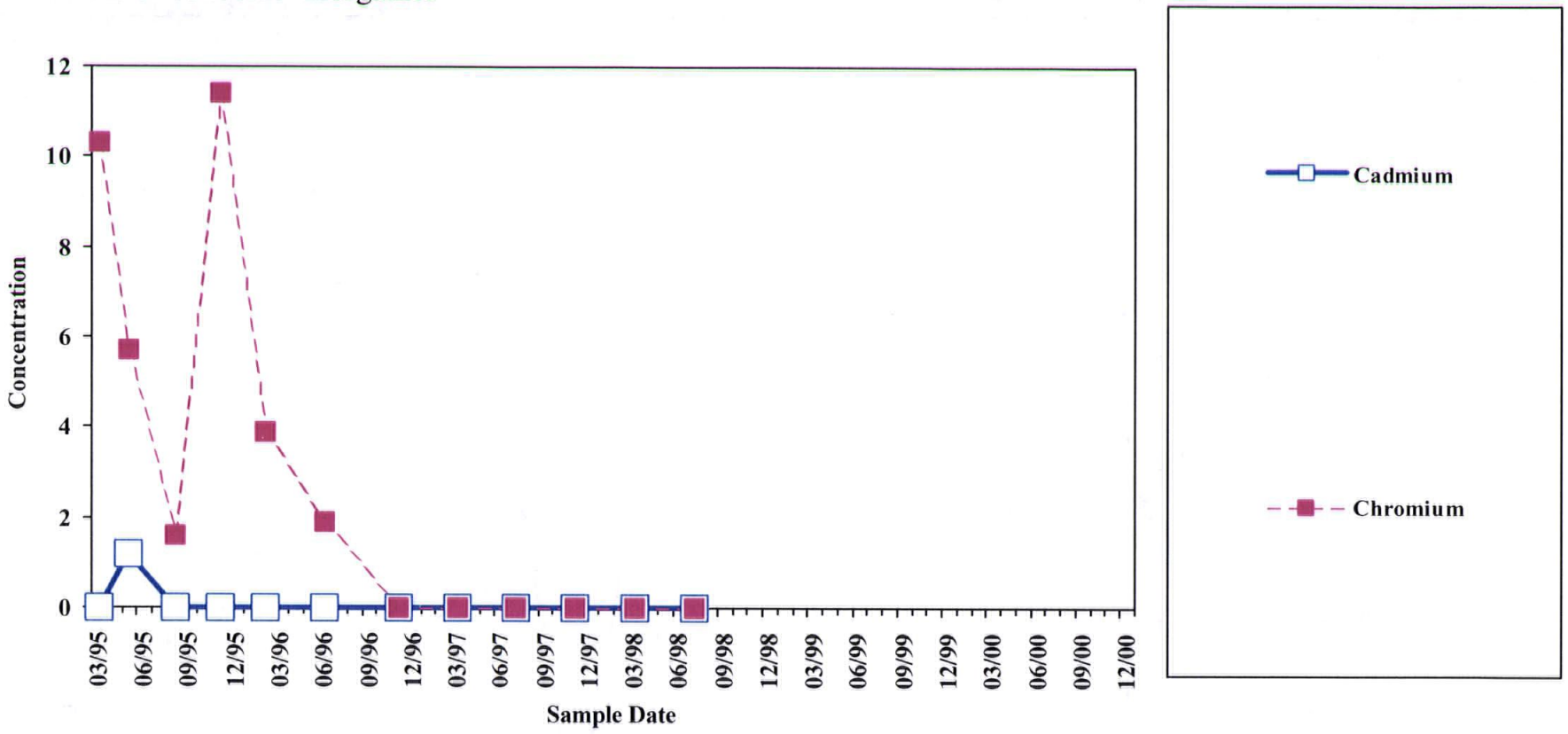
Sample Location:

MW-NASB-080

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

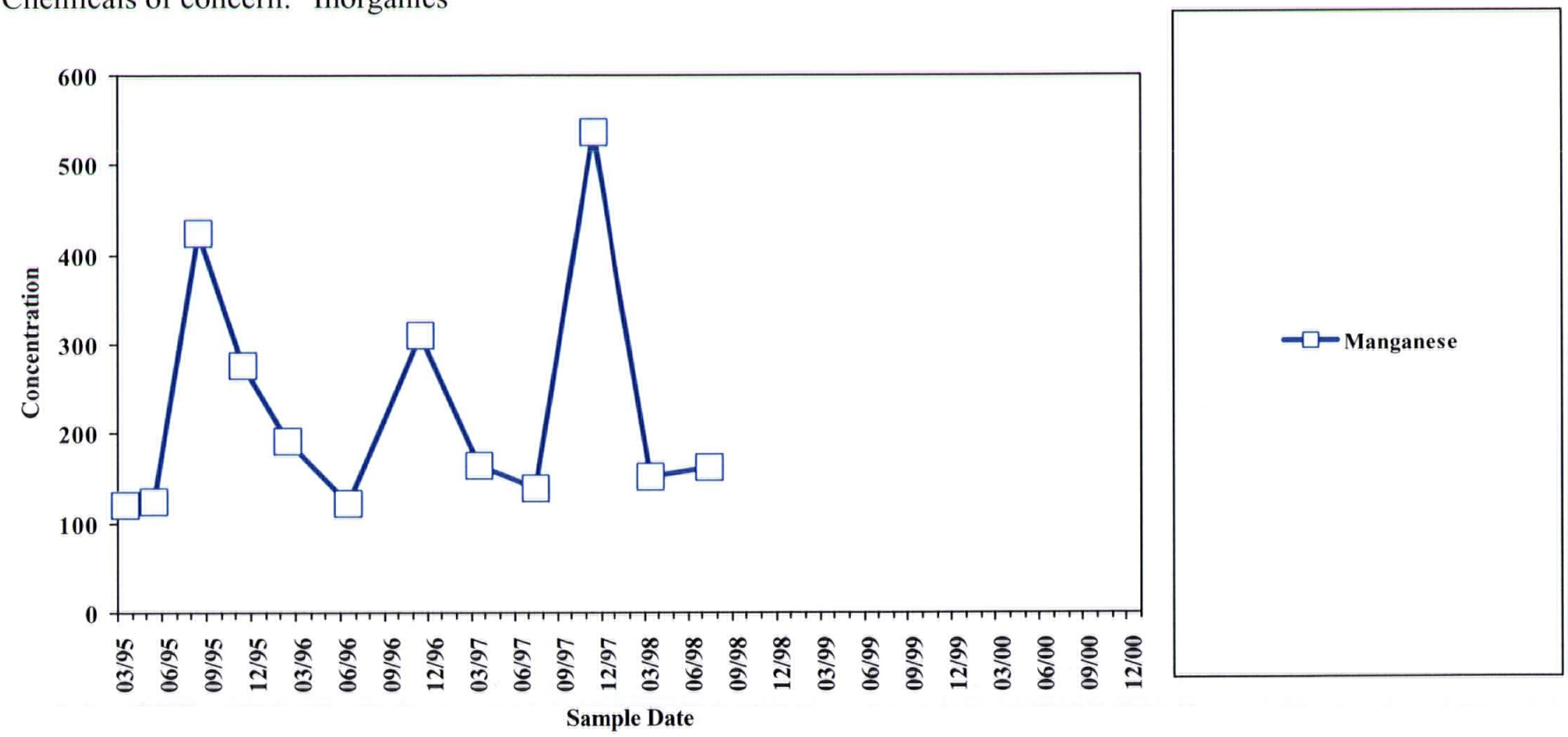
Sample Location:

MW-NASB-080

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

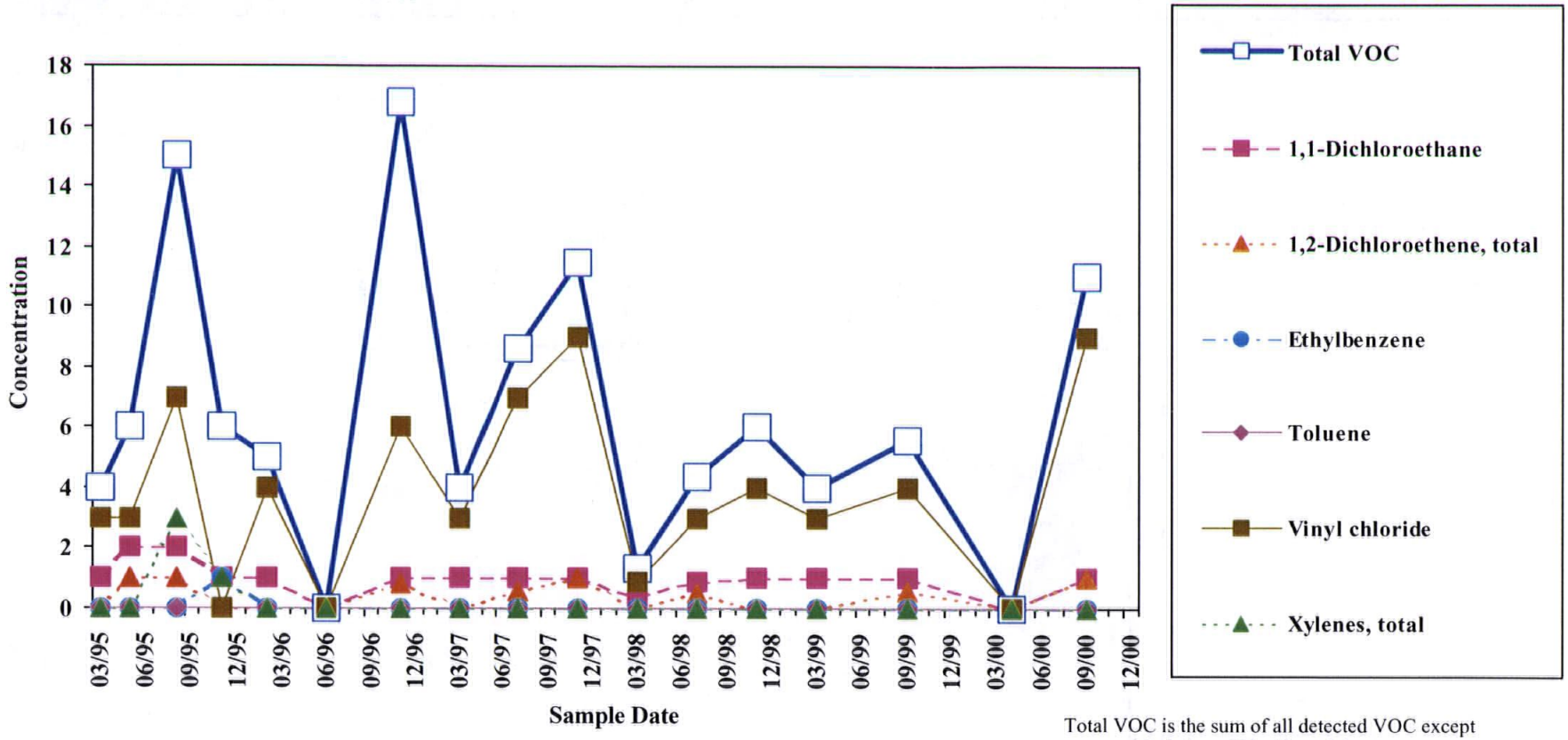
Sample Location:

MW-NASB-080

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

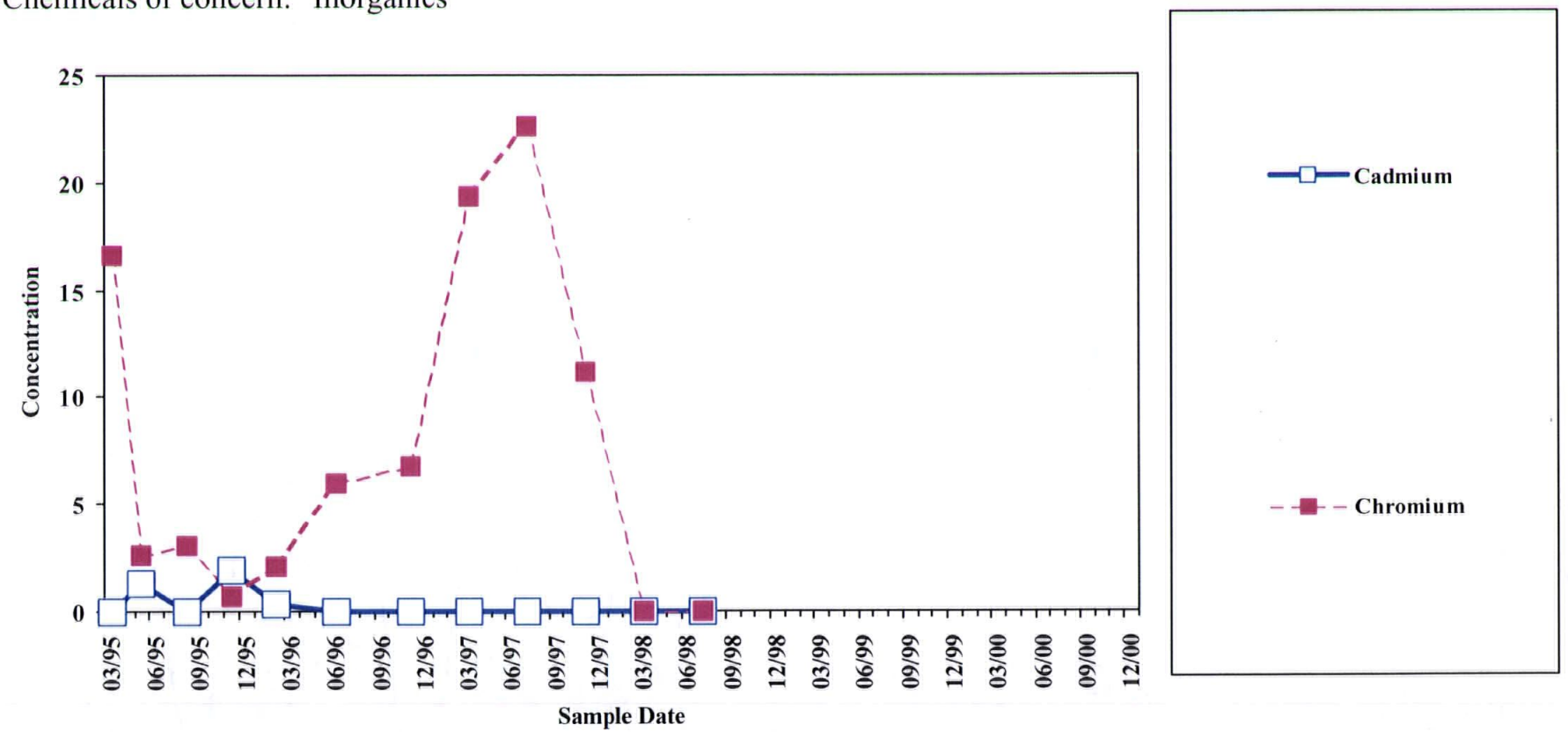
Sample Location:

MW-NASB-081

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Cadmium		Chromium	
MEG:	5	MEG:	100
MCL:	5	MCL:	100

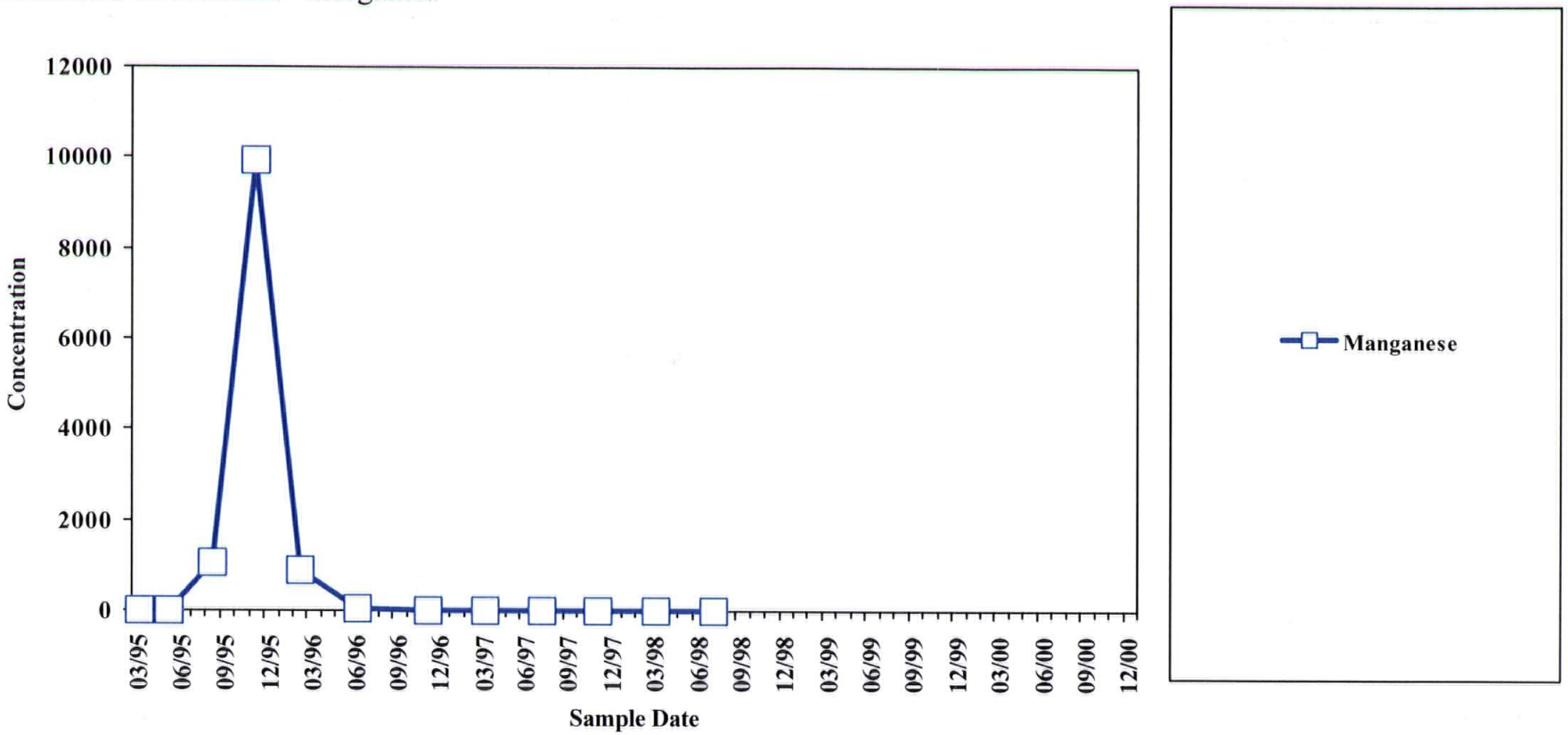
Sample Location:

MW-NASB-081

Site 9

Ground Water

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: µg/L

Manganese	
MEG:	200
MCL:	50

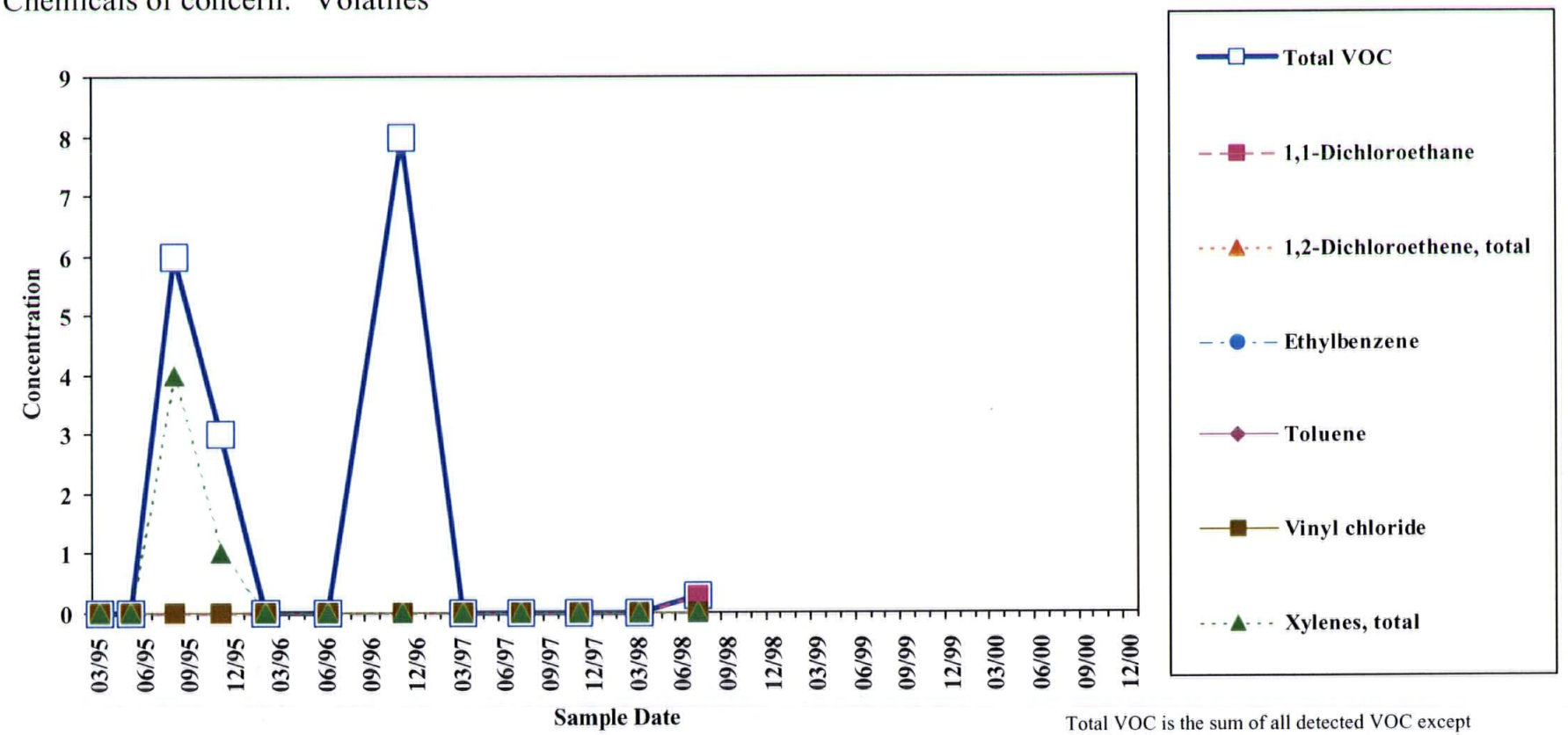
Sample Location:

MW-NASB-081

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

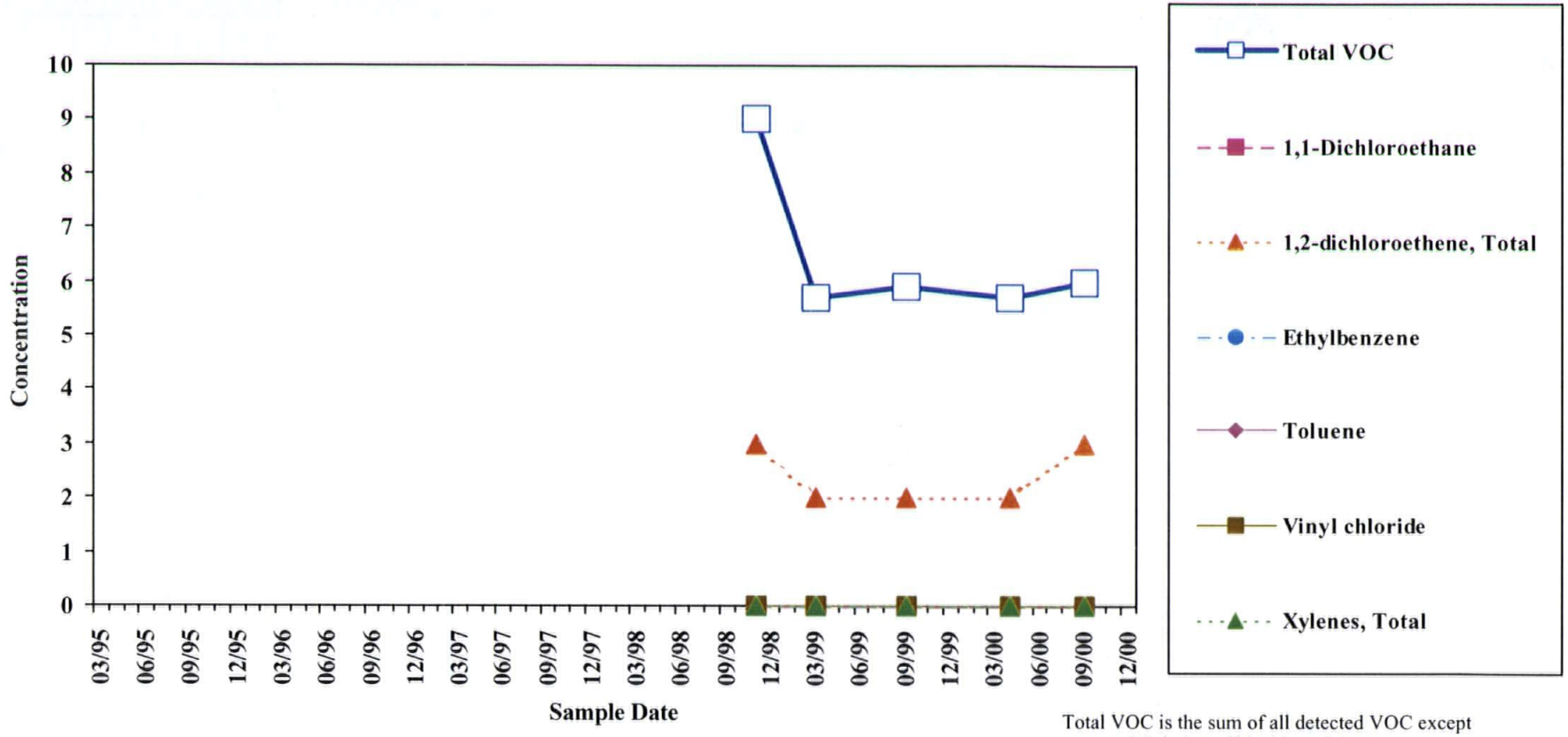
Sample Location:

MW-NASB-227

Site 9

Ground Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

1,1-Dichloroethane		1,2-Dichloroethene, total		Ethylbenzene		Toluene		Vinyl chloride		Xylenes, total	
MEG:	70	MEG:	70	MEG:	700	MEG:	1400	MEG:	0.15	MEG:	600
MCL:	-	MCL:	70	MCL:	700	MCL:	1000	MCL:	2	MCL:	10000

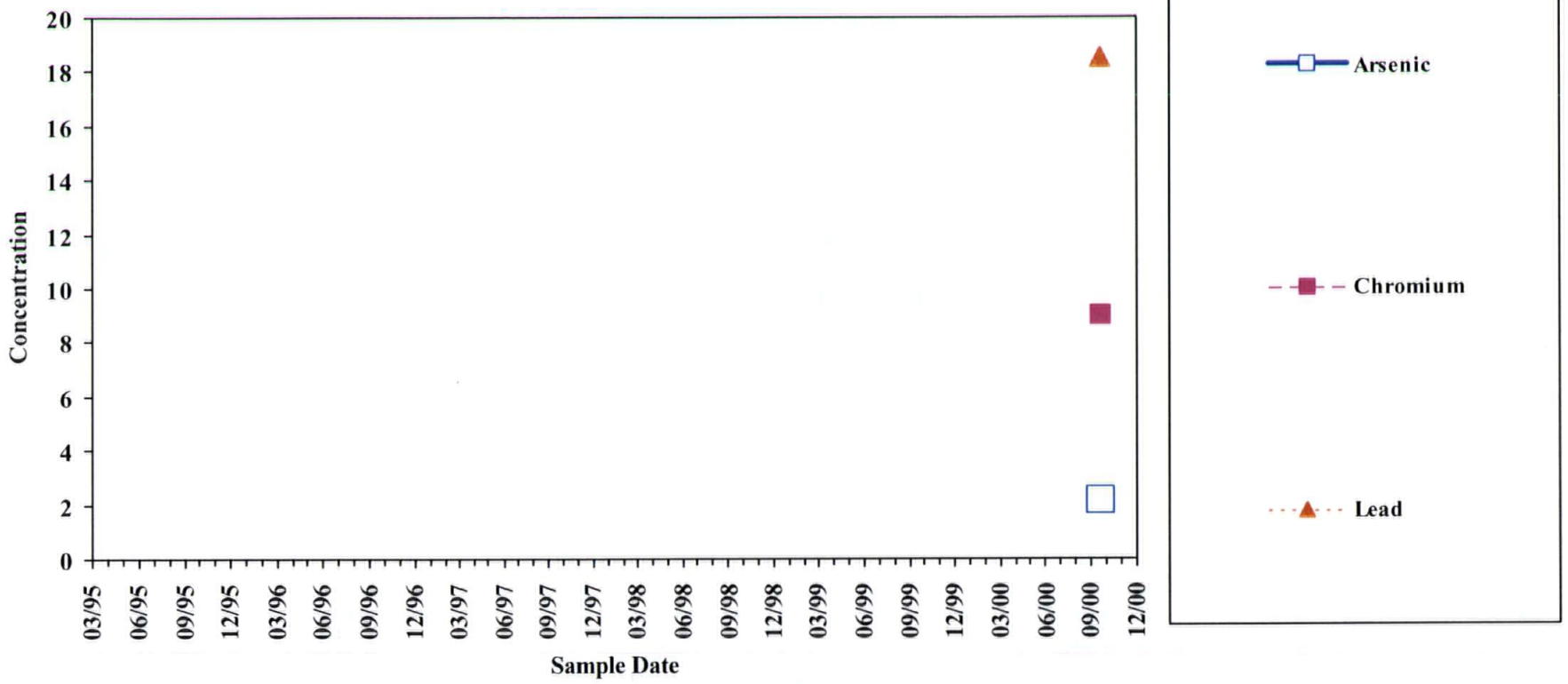
Sample Location:

SED-10

Site 9

Sediment

Chemicals of concern: Inorganics



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Sample concentration units: mg/Kg

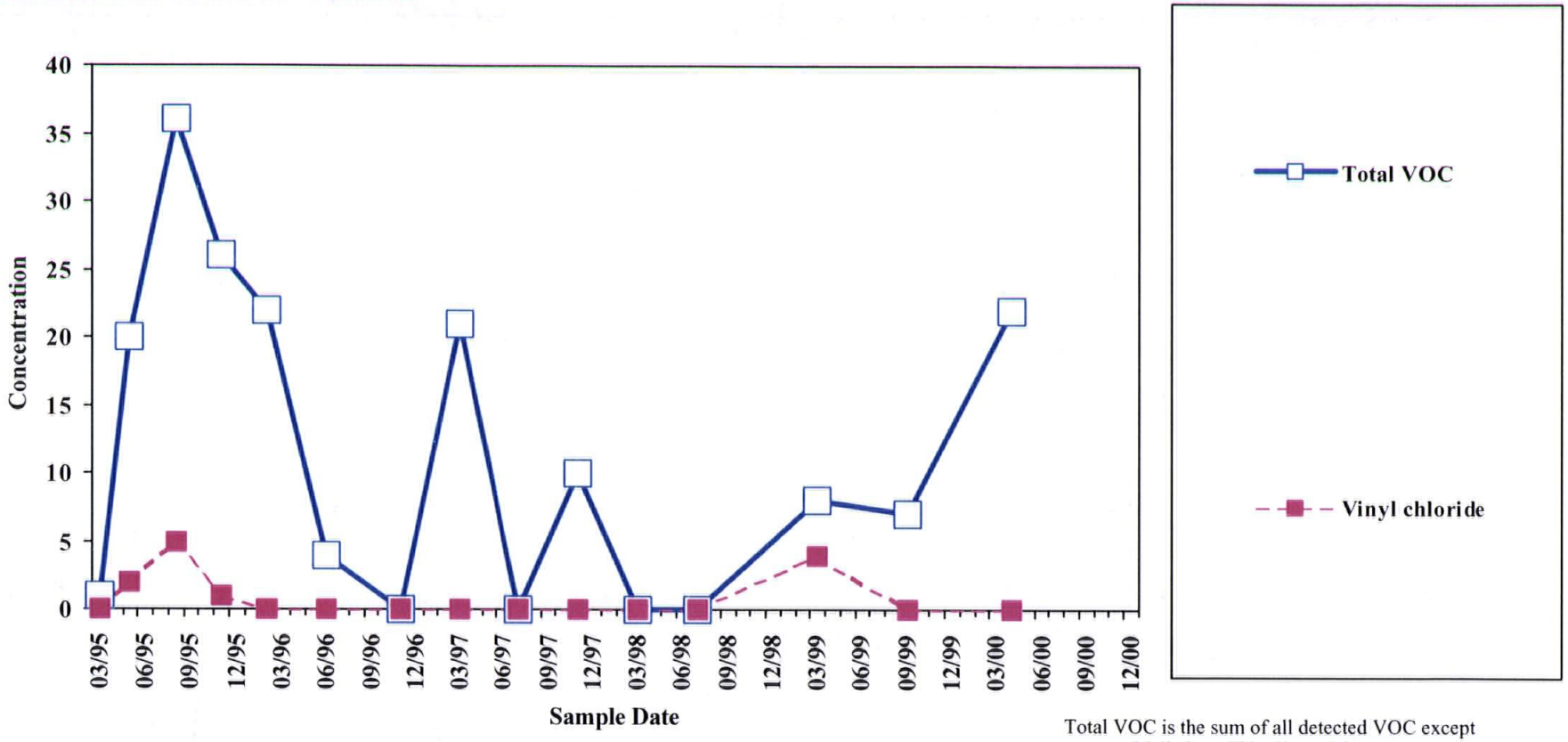
Sample Location:

SED-10

Site 9

Sediment

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/Kg

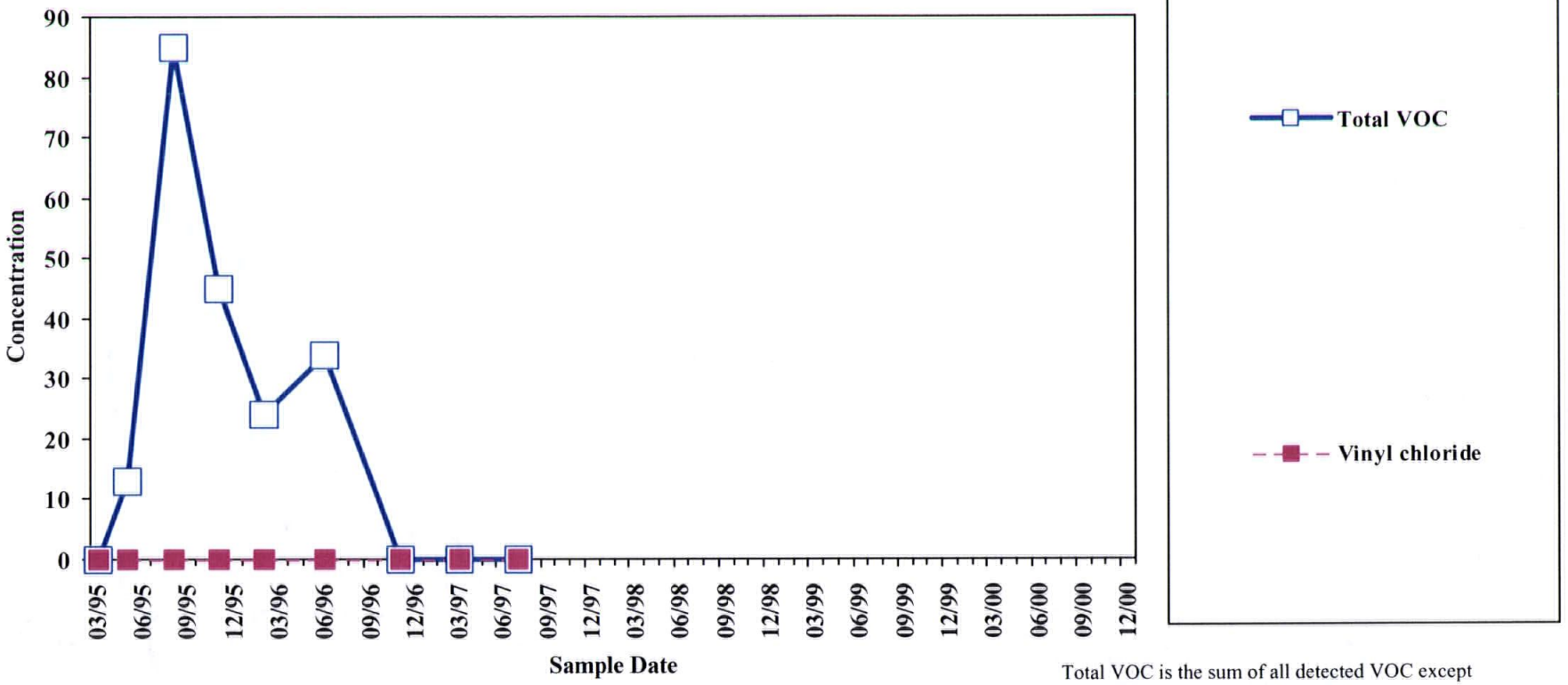
Sample Location:

SED-11

Site 9

Sediment

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/Kg

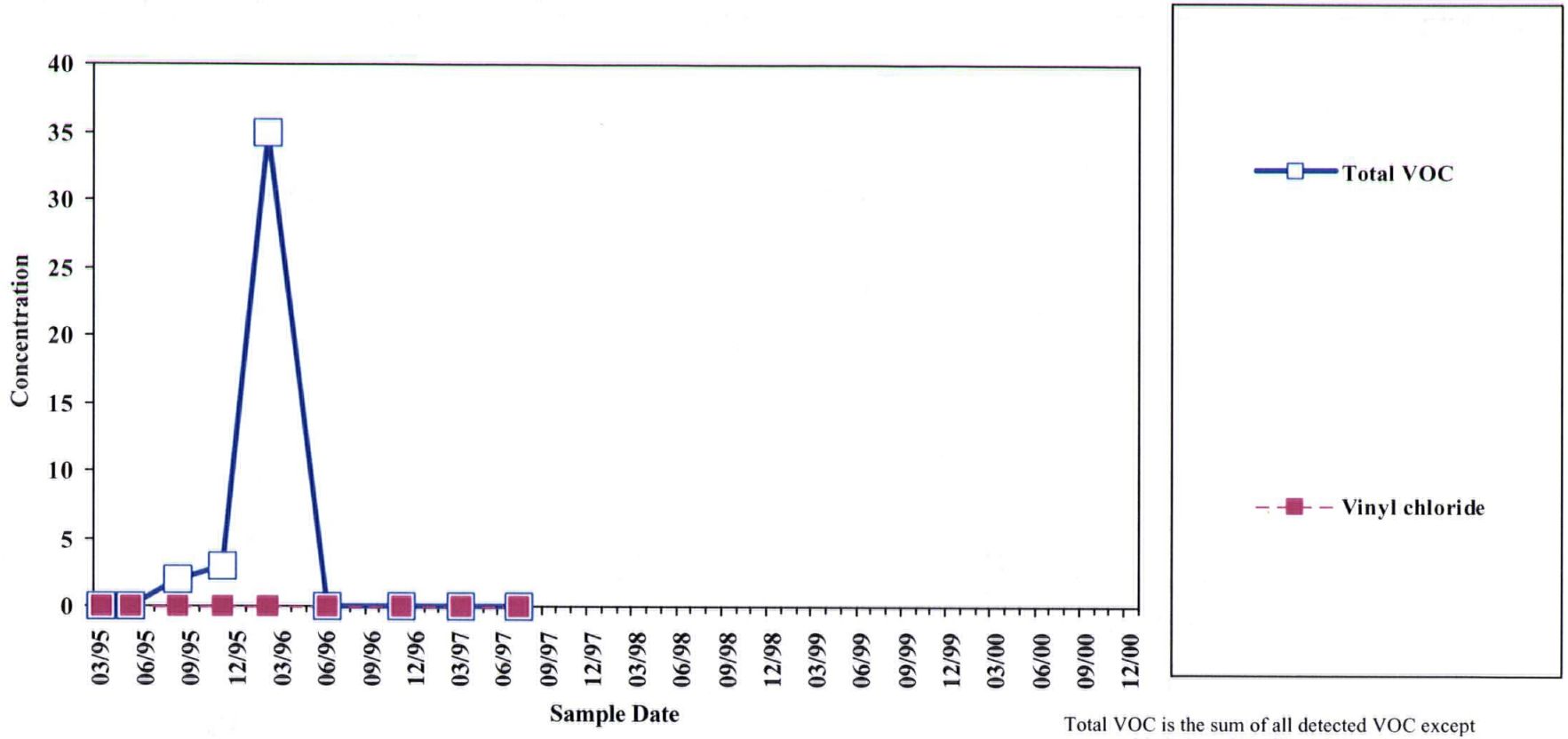
Sample Location:

SED-12

Site 9

Sediment

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/Kg

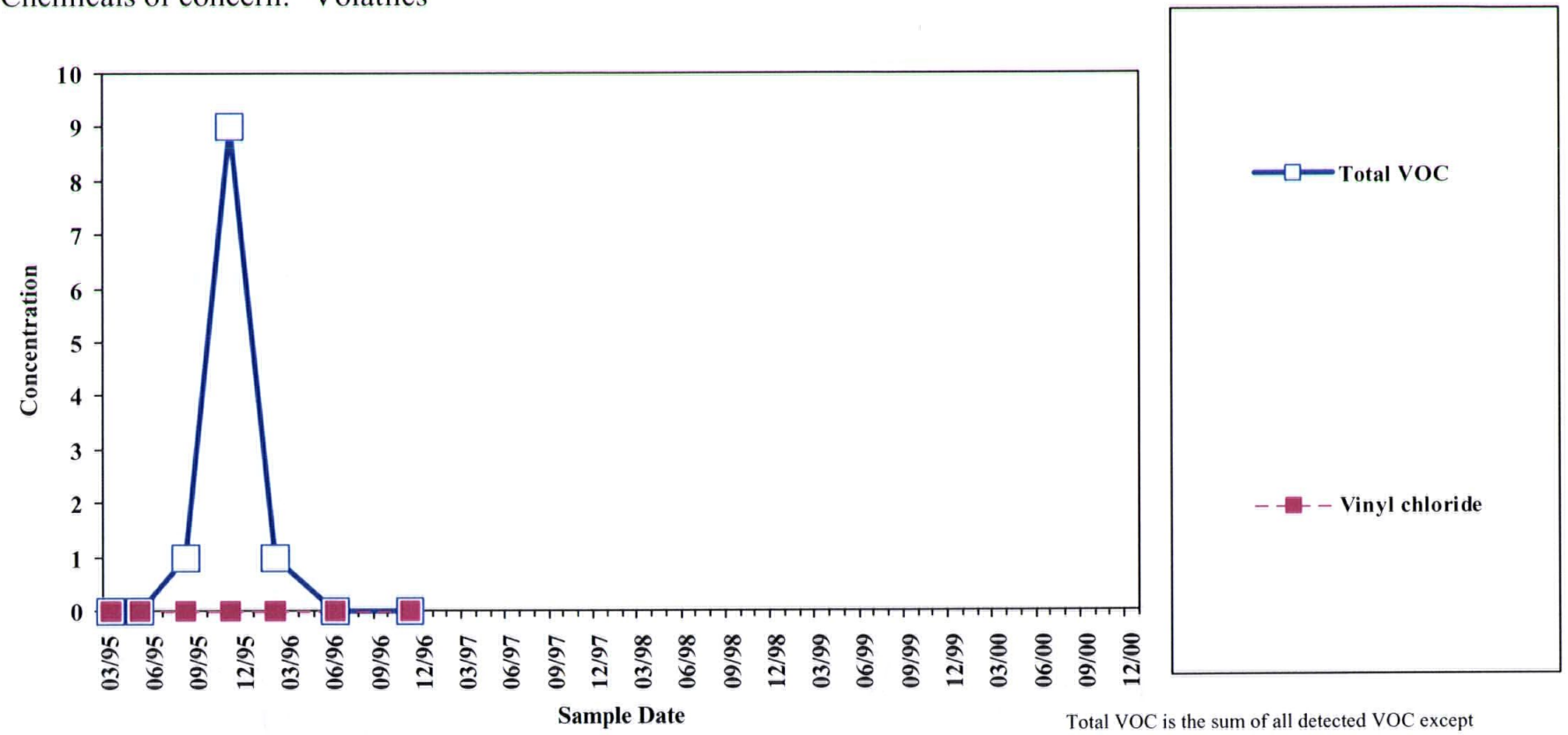
Sample Location:

SED-915

Site 9

Sediment

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/Kg

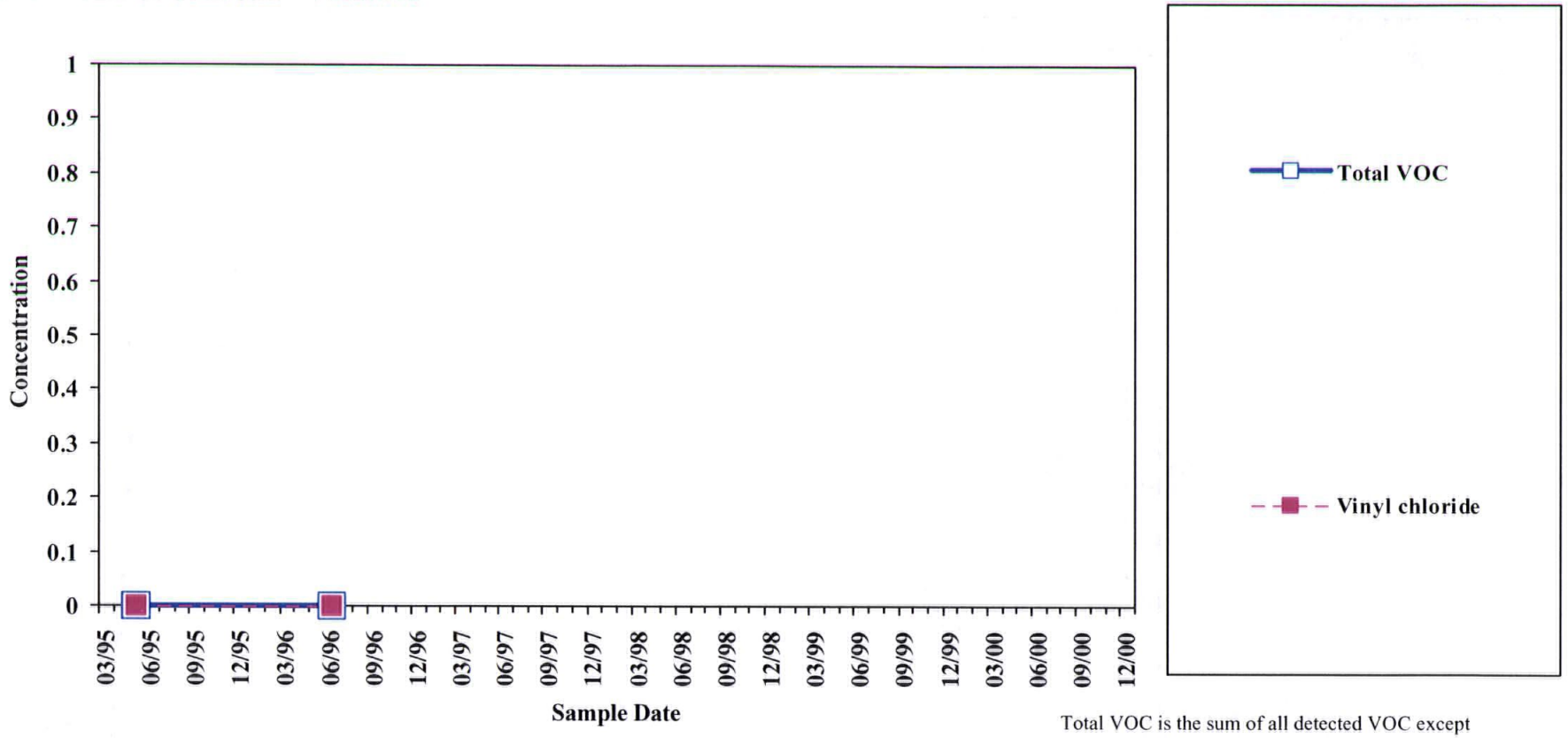
Sample Location:

SED-916

Site 9

Sediment

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/Kg

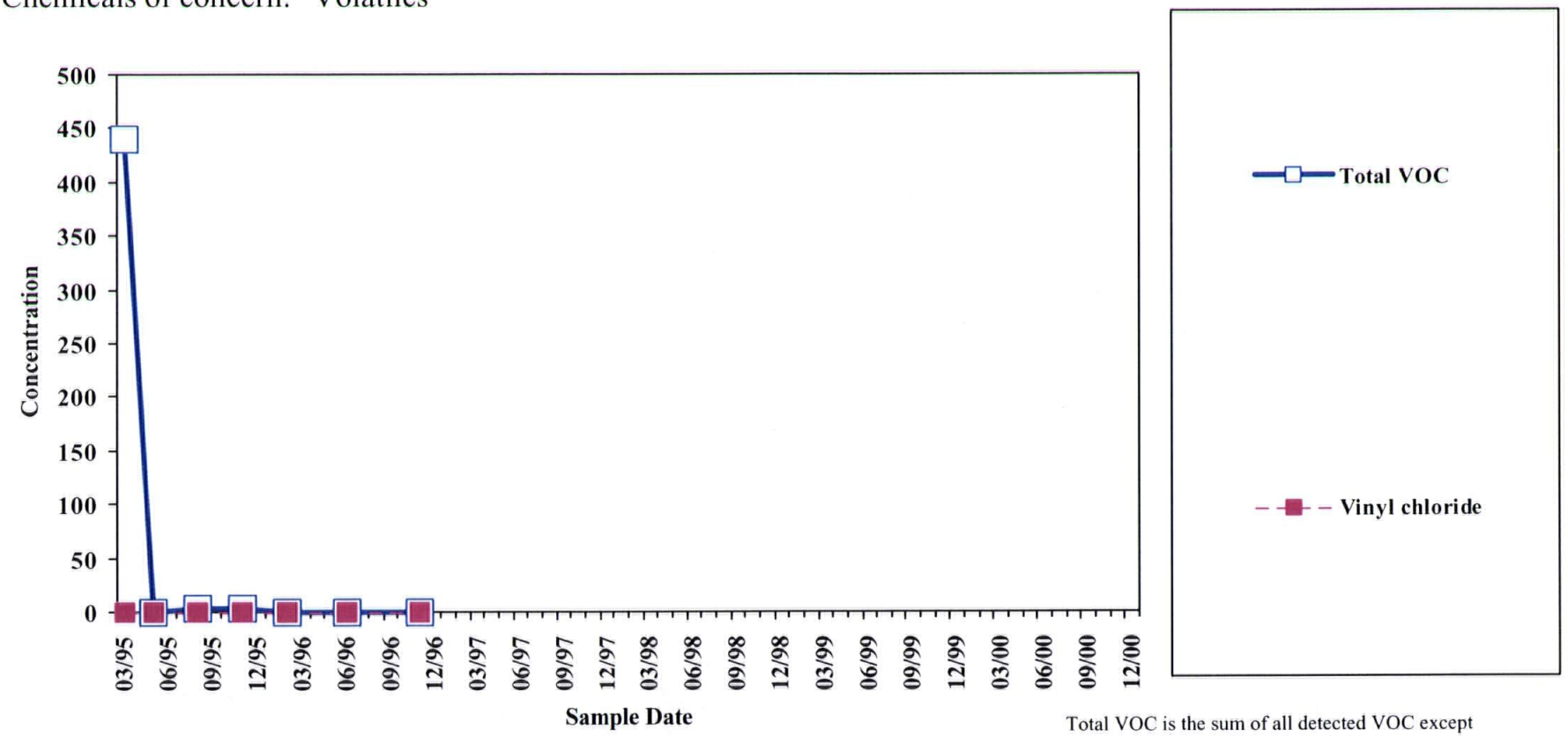
Sample Location:

SED-919

Site 9

Sediment

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/Kg

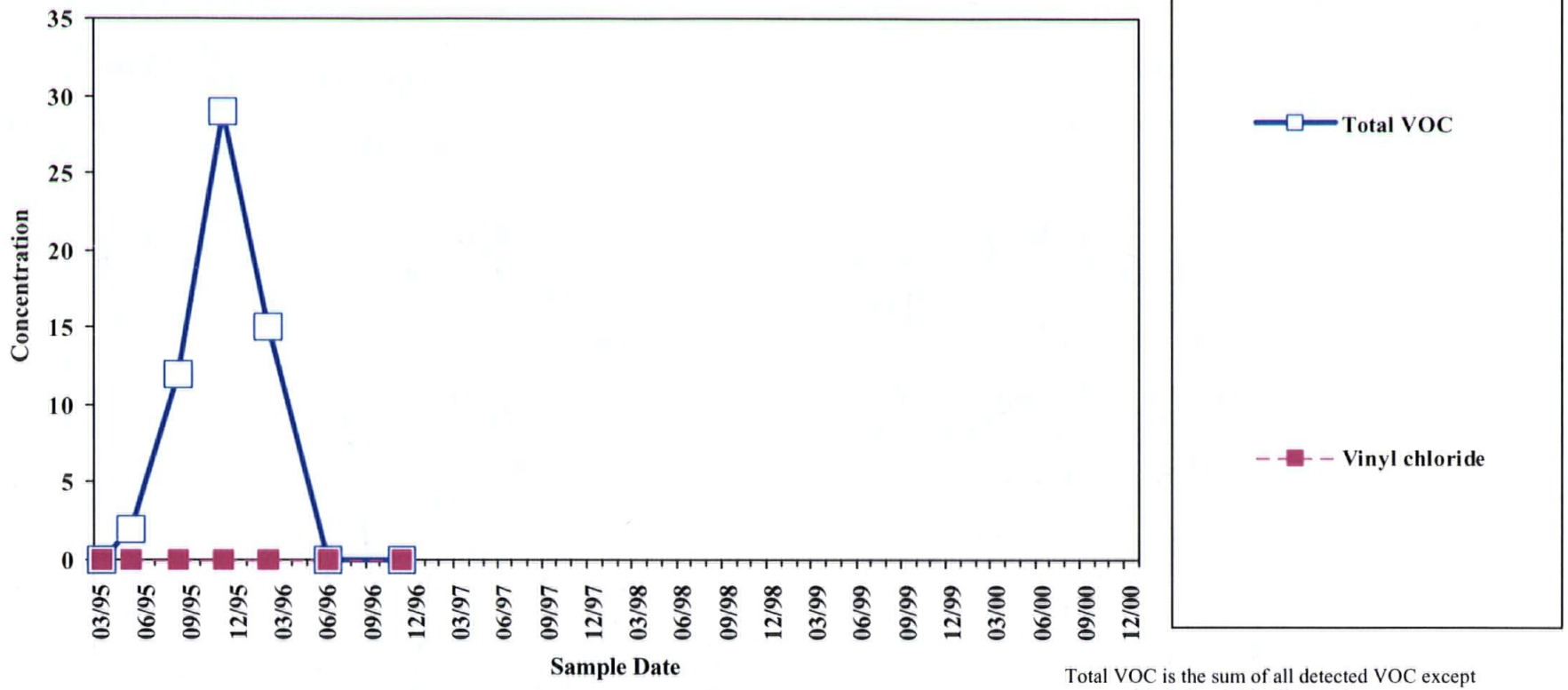
Sample Location:

SED-922

Site 9

Sediment

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/Kg

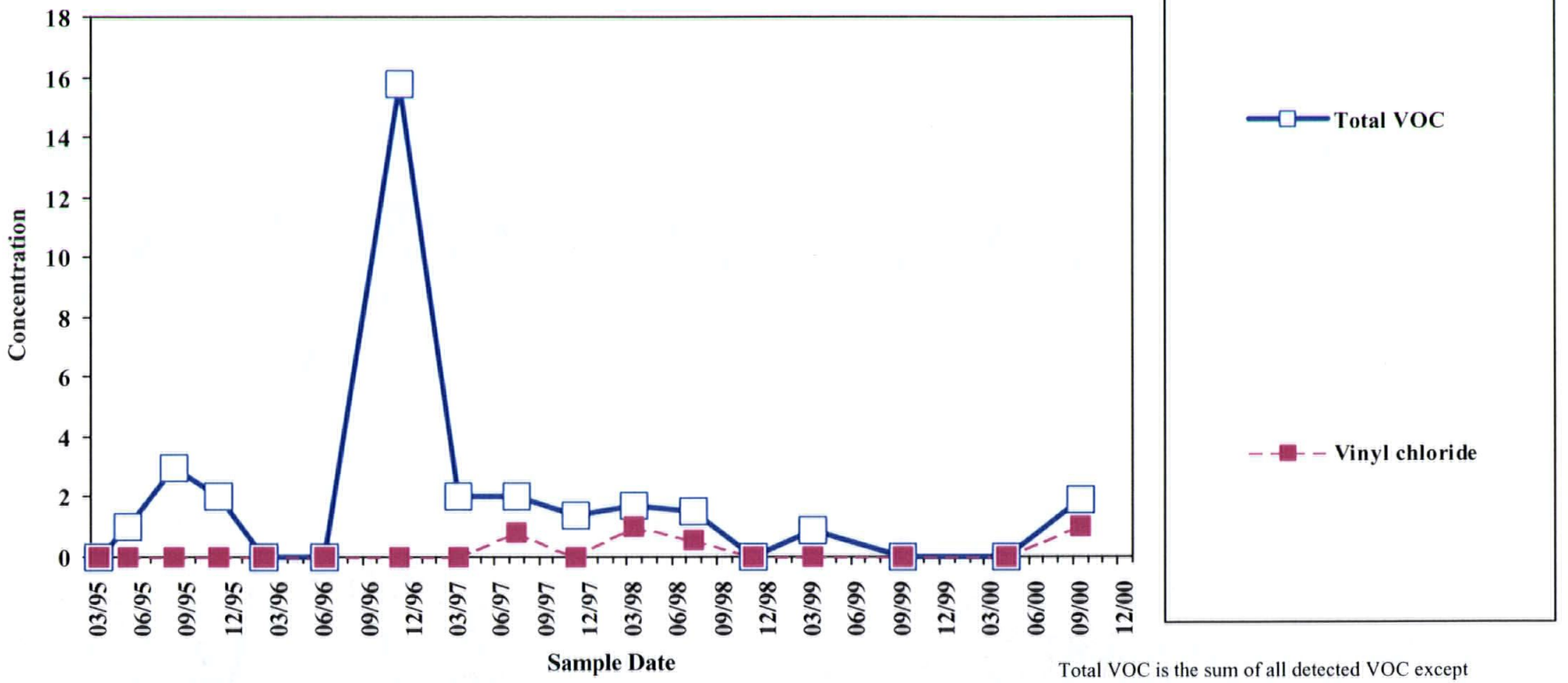
Sample Location:

SW-010

Site 9

Surface Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

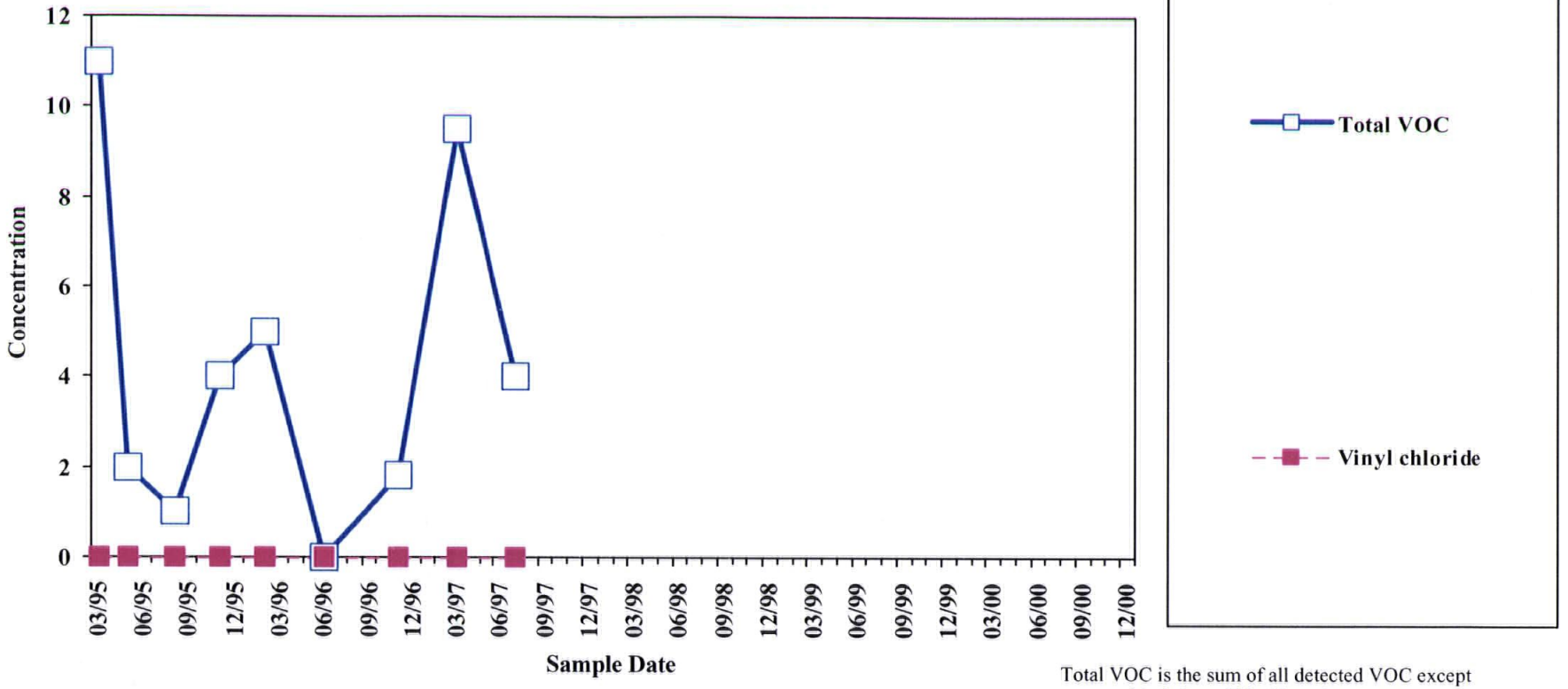
Sample Location:

SW-011

Site 9

Surface Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

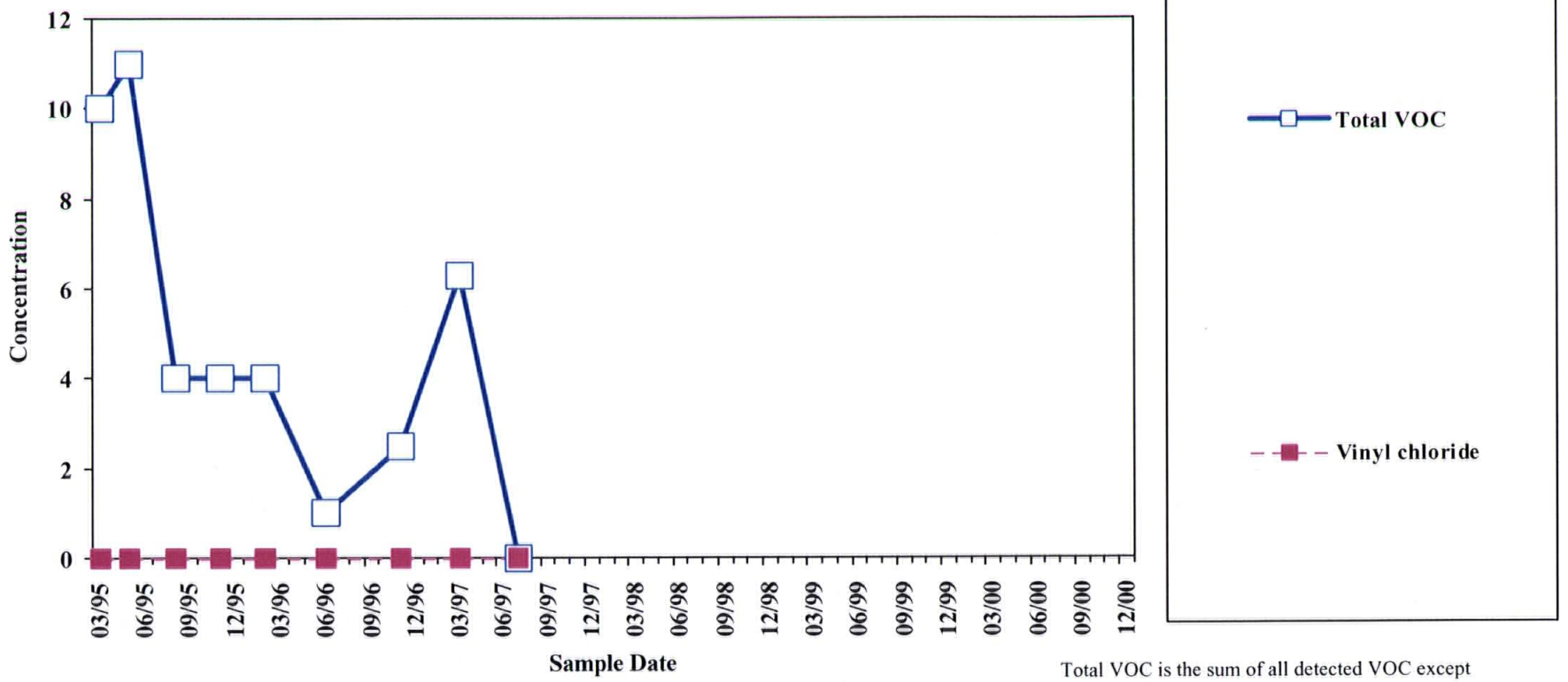
Sample Location:

SW-012

Site 9

Surface Water

Chemicals of concern: Volatiles



Analyte concentrations less than the sample detection limit are plotted as zero concentration on this chart.

Total VOC is the sum of all detected VOC except Methylene Chloride and Acetone.

Sample concentration units: µg/L

Appendix B

Response to Comments for the 1999 Annual and Monitoring Events 16 and 17 Reports

RESPONSE TO COMMENTS FROM THE
U.S. ENVIRONMENTAL PROTECTION AGENCY
ON THE 1999 ANNUAL REPORT, MONITORING EVENTS 14 AND 15
SITE 9: NEPTUNE DRIVE DISPOSAL SITE
NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Michael Barry **DATED: 10 April 2000**

Thank you for the opportunity to review the above report. Upon our review, we generally concur with the findings and conclusions. Natural attenuation by dechlorination and diffusion appears to be occurring at site 9 and with Institutional Controls, the remedy is protective. However, the EPA has several concerns, most notably that source control has been an ongoing problem that has been difficult to resolve at Site 9. We remain committed to keeping monitoring results in the context of the expected 20-year duration of the remedy.

Please see more specific general and specific comments in the attachment. To aid in response, comments are coded as below. General and specific comments have also been combined.

(RR)	Response requested.
(NR)	Means no response required, usually an observation or note.
(ED)	Means editorial comment or suspected typographical/format error.
(MTG)	Means comment should be discussed prior to response.

SPECIFIC COMMENTS

1. (RR/MTG). Regarding rising VOC concentrations. It is true that vinyl chloride concentrations will rise due to higher parent 1,2-dichloroethylene (DCE) concentration as dechlorination occurs. However, incoming vinyl chloride concentrations rose in wells MW-69 and MW-80 and seem to roughly track with DCE concentrations. Perhaps the air sparging remedy at the upgradient Navy Exchange Service Station (NEX) site has some influence upon this. If VOCs continue to rise, at some point enough potential risk would be presented to require some type of source control action (barrier wall, phytoremediation, or actual source location to name a few). Section 3.1.2, second bullet, second dash refers.

   Response—The dissolved oxygen was found to have similar concentrations in NEX wells MW-NASB-008, MW-NASB-009, and MW-NASB-010 and Site 9 monitoring wells MW-NASB-081 and MW-NASB-080. These dissolved oxygen data from Monitoring Event 15 suggest a possible influence, but a small influence since the area immediately downgradient of the landfill area has quite different dissolved oxygen levels than the dissolved oxygen measured in the wells north of the landfill. However, only one round of dissolved oxygen measurements have been collected to date (Monitoring Event 15) from both the NEX and Site 9 wells. Additional data will be collected during Monitoring Events 16 and 17 in 2000 and further evaluated and assessed to determine if the operation of the remedial system at

the NEX is affecting the water quality within Site 9. If the VOC concentrations continue to rise to the point where there is potential risk, a remedial action would be evaluated to reduce the risk.

It should be noted that previous increases (April and November 1998 and September 1999) in DCE and vinyl chloride have been noted in the past, and concentrations have then decreased (July 1998 and February 1999). While the increases at MW-NASB-069 have been larger than previously noted, natural changes in hydrogeologic conditions may reduce VOC concentrations without need for remedial actions.

2. (RR/MTG). Regarding VOCs detected in surface water and sediment at SW/SD-010. We concur with further monitoring as current levels are below risk screening levels. However, because of expected dilution by volatization, their presence is a concern. Consideration should be given to using water diffusion samplers to characterizing local ground-water discharge.

   Response—This issue was discussed at the 11 April 2000 Technical Meeting. Additional surface water sampling would be considered if VOC concentrations in ground water continue to rise, based on discussions with the RAB. As noted during the Technical Meeting, the ambient water quality criteria for VOCs are several orders of magnitude above detected concentrations in ground water. Therefore, the ROD specified remedy of natural attenuation is considered to be effective at this time. This response also relates to EPA's observations in Specific Comment No. 5 below.

3. (NR/MTG). Natural attenuation of DCE to vinyl chloride is clearly occurring due to the high portion of vinyl chloride in many wells of about 50 percent and the rising ratio of vinyl chloride to DCE. As successful as the dechlorination of VOCs is though, a constant inflow of new VOCs into the area will slow the removal of VOCs.

   Response—No response is required, these items were discussed at the 11 April 2000 Technical Meeting (documented by the April meeting minutes) at NAS Brunswick, Maine.

4. (RR/MTG). The NEX site petroleum remediation system and the degradation of BTEX compounds may be causing low dissolved oxygen and Eh readings at Site 9 (except for downgradient of the landfill). This actually presents ideal conditions for dechlorination of the VOCs at Site 9. Because of the remedial system in operation and that BTEX compounds degrade so readily, it is not surprising that they are not detected at Site 9. But is it possible that the BTEX compounds at the NEX are "masking" the low level VOCs migrating to Site 9 by the current testing methods? It's also an interesting coincidence that rising VOCs in MW-69 and MW-80 were detected about the same time the remedial system and the NEX began operation. Section 3.1.2, third bullet refers.

   Response—NEX ground-water samples were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by U.S. EPA Method 8260. These samples have a detection limit of 1 µg/L for each BTEX compound. Therefore no "masking" of low levels of VOCs at NEX wells is believed to be occurring.

5. (NR/MTG). Several mitigating factors at Site 9 imply that inflow of VOCs is more an issue of how much time will be required to clean up the ground water versus effectiveness of the remedy.

   a. The ground water and surface water in the outflow area is also well characterized in nature and extent and has not been impacted by a level of VOCs that could cause risk to human health or the environment to date. In fact, a moderate amount of VOC discharge will probably be not measurable in the ponds or surface water.

   b. Because of volatization of VOCs, a significant discharge would probably be needed to present a risk (such as at the McKin site) by exceeding the ambient water quality criteria or presenting a vapor hazard to human health.

   c. Though EPA prefers destruction of VOCs through dechlorination, dispersion and diffusion are valid natural attenuation mechanisms and are currently utilized at several Superfund sites. Further, dispersion by volatization are maximized since the downgradient wells have higher percentages of vinyl chloride.

   Response—We agree with these observations. No response is required, as these items were discussed at the 11 April 2000 Technical Meeting at NAS Brunswick, Maine.

6. (NR/MTG). The VOC contamination detected in MW-227 appears to be of different character because of the presence of TCE and PCE. Since an aircraft maintenance area is upgradient of this well, it is possible for there to be either a historical or current undetected source. Evaluating this source should be in context of other issues at Site 9 and the current contamination levels at MW-227 (below the MCL). True, they will decay to vinyl chloride above the MEG, but this area is hydraulically contained within Site 9. Section 3.1.2, fourth bullet refers.

   Response—This issue was discussed at the 11 April 2000 Technical Meeting at NAS Brunswick, Maine. It should be noted that the VOC concentrations detected at NW-NASB-227 are not unique, and are very similar to concentrations detected at MW-NASB-74 during 1999 (refer to Table 5 in Monitoring Event 14 and 15 Reports). Therefore, it is possible that the presence of these compounds may be related to site-wide low level VOC impacts, rather than a specific source located upgradient of MW-NASB-227.

7. (ED). Section 1.2, Paragraph 2. Delete "proposed" as the remedy is now final since the ROD has been signed.

   Response—The text will be edited as recommended.

   "long-term effectiveness of the ~~proposed~~ remedial action...."

8. (ED/MTG). We didn't receive the updated cross-section (Figure 2.1 to the 1998 final report) referred to in the response to comments for Monitoring Events 14 and 15. This figure

should be included in the annual reports as it greatly aids in understanding the 3-dimensional hydrogeology of Site 9. We concur with omitting the rest of the detailed geological information out of the annual reports.

Response—The following text and figure have been added to the end of the last paragraph of Section 1.2:

> *A complete description of site geologic conditions is not presented in this Annual Report, but can be found in previous Annual Reports for Site 9. A geologic cross-section of the site is shown in Figure 1-3 to illustrate general site geology.*

As noted during the 11 April 2000 Technical Meeting, the description of other site geological information will not be included in the Annual Report, unless additional data are collected that would warrant reassessment of geological conditions.

9. (ED). LT-901 graphs don't have any 1999 data. Also what was the VOC source in December 1998; was it a laboratory artifact?

   Response—There were no detections of VOCs at LT-901 (seep leachate sample) during 1999 (refer to Table 9 in the Monitoring Event 14 Report, and Table 10 in the Monitoring Event 15 Report). We believe the commentator is referring to the November 1998 data; no data were collected during December 1998. The VOCs detected in November 1998 included several compounds detected at concentrations less than 2 µg/L (refer to Table 8 in Monitoring Event Report 13).

10. (ED). Good note on the graphs with the caveats acetone and methylene chloride artifacts not included in total VOCs.

    Response—Comment noted, no response is required.

11. (ED). Merge the two MW-227 graphs on Pages 4 and 34 of 49 into one graph.

    Response—The two MW-227 graphs have been merged into one graph for the Final 1999 Annual Report.

EPA's Comment Summary Table

Number	RR	ED	NR	MTG	Refers to
1	X			X	Rising VOCs
2	X			X	VOCs in SW/SD
3			X	X	Natural Attenuation
4	X			X	NEX Site Affects
5			X	X	Mitigating Factors
6			X	X	MW-227 VOCs
7		X			Text Edit
8		X		X	Geological Cross-Section
9		X			LT-901 Graphs
10		X			----
11		X			Merge MW-227 Graphs

RESPONSE TO COMMENTS FROM THE STATE OF MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION ON THE 1999 ANNUAL REPORT, MONITORING EVENTS 14 AND 15 SITE 9: NEPTUNE DRIVE DISPOSAL SITE NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Claudia Sait **DATED: 4 April 2000**

The Maine Department of Environmental Protection (MEDEP or Department) has reviewed the report entitled *1999 Annual Report, Monitoring Events 14 and 15, Site 9: Neptune Drive Disposal Site*, dated February 2000, prepared by EA Engineering, Science, and Technology. Based on that review, the Department has the following comments and issues.

Each of our comments is followed with a code that indicates whether a response is required (RR), no response is required (NR), editorial correction needed (ED), or meeting discussion requested (MTG). No response is required for editorial corrections unless the Navy disagrees with the correction.

GENERAL COMMENTS

1. The Department is pleased that the Navy plans to collect additional data in 2000 for direct comparison of the Site 9 wells with Navy Exchange Service Station wells.

2. The Department is surprised that a pH field-recorded value of 2.08 for leachate seep LT-901 was not checked with a second field meter. While the likely explanation is a faulty meter, the Navy should not make this assumption for surfacing water that is not in a secured area. Historic inorganic analyses for sediment at LT-901 have shown elevated lead concentrations during two time periods prior to the cessation of sediment sampling in August 1998. Low pH and elevated lead levels might be related. If low pH is found during Monitoring Event 16, the Department will ask that inorganic analyses be reinstated and the source of the low pH investigated. (RR)

   Response—This was discussed at the 11 April 2000 Technical Meeting. On 11 April 2000 prior to the Technical Meeting, EA personnel measured the pH of LT-901 and the pH measurements ranged from 6.0 to 6.5, which is similar to all previous measurements with the exception of the erroneous measurement during Monitoring Event 15. Therefore, this measurement is assumed to be related to field or transcription error. For future sampling efforts, if a low or high pH reading (anomalous reading) is recorded in the field, it will be verified by field personnel to confirm the reading is a representative measurement of the field conditions. It is anticipated this field recording protocol will be included in the next revision of the Long-Term Monitoring Plans for each site.

SPECIFIC COMMENTS

3. ***Long-Term Monitoring Program, Section 1.2, Page 2, Bottom of Paragraph***—Ground-water elevation data were gathered to assess whether ground water from the Navy Exchange Service Station air sparging may be flowing to and affecting the ground-water geochemistry of Site 9.

   MEDEP appreciates the Navy including these upgradient wells, however, ground-water elevation data cannot directly be used to assess whether ground-water geochemistry is being affected downgradient. If a hydraulic connection is established using elevation data, then certain geochemistry parameters may be assessed for changes between upgradient and downgradient areas. MEDEP suggests the following change:

   > *Ground-water elevation data were gathered to assess whether ground water from the Navy Exchange Service Station air sparging may be flowing to ~~and affecting the groundwater geochemistry of~~ Site 9.* (ED)

   Response—The text has been changed in the final report as recommended.

4. ***Water Level Gauging Program, Section 3.1.1, Page 1, 1st Bullet***—Shallow ground water south of the upper impoundment pond is hydraulically unrelated to Site 9.

   This is not quite true; the pond is a discharge area for ground water immediately to the south. This statement would be better written as follows:

   > *Due to the presence of the pond, the quality of shallow ground water south of the pond is not linked to the quality of shallow ground water north of the pond.* (ED)

   Response—The text has been changed in the final report as recommended.

5. ***Summary and Conclusions, Sections 3.1.1 and 3.1.2, Pages 2 and 3, Water Level Gauging Program, Section 3.1.1, Page 2, Top of Page***—These dissolved oxygen concentrations measured during 1999 suggest that the ground-water geochemistry at Site 9 is not being affected by the operation of the remedial system at the Naval Exchange Service Station.

   Ground-Water Monitoring and Sampling Program, Section 3.1.2, Pages 2 and 3, 2nd and 3rd Bullets—Samples of Site 9 ground water have not reported significant concentrations of VOCs that would be commonly found in gasoline, which suggests impacts at Site 9 may be limited to potential impacts on site dissolved oxygen or Eh conditions.

   The Department disagrees with the first statement, and partially disagrees with the second statement. The presence of impacts to dissolved oxygen concentrations would be expected to noticeably alter ground-water geochemistry. Although BTEX compounds are virtually absent at wells MW-NASB-8, MW-NASB-9, and MW-NASB-10, diesel range organics are present in MW-NASB-9 and MW-NASB-10. Only 110 ft upgradient of MW-NASB-9, well MW-NASB-226 had a gasoline range organics concentration of 2,300 µg/L in December 1999. Total BTEX concentration at MW-NASB-226 was 1,600 µg/L.

It is our interpretation that oxygen-depleted ground water at the leading edge of the Navy Exchange Service Station fuel plume is migrating into Site 9 where the anaerobic water is causing an increased rate of dechlorination of DCE to vinyl chloride. Thus, the long-term oxygen depletion thought to be caused by BTEX degradation at the NEX could explain the 1998-1999 increasing vinyl chloride concentration trend downgradient. With the exception of MW-NASB-080 (which changed from low to moderate levels of dissolved oxygen in 1999), all other wells in the middle of Site 9 have shown either zero or very low oxygen concentrations. All wells with near normal oxygen concentrations farther downgradient are located within 100 ft of the impoundment drainage. It seems likely that the combined effect of shallowness of the ground water near the ponds and a probable state of exhausted dechlorination (having run its course just upgradient) would promote a recovery of oxygen in ground water downgradient of Building 201.

Response—We disagree with the interpretation noted in this comment that the addition of oxygen upgradient of Site 9 at NEX is likely to increase biodegradation. It is more likely that chlorinated solvent compounds will under go dechlorination in anaerobic conditions. It should be noted that many site conditions could be responsible for the volatile organic compounds trends observed in Site 9 ground water, and dissolved oxygen concentrations. The observations noted in this comment are one possible explanation, although other factors may explain these observed trends (i.e., seasonal fluctuations, precipitation, and/or a combination of seasonal factors).

a. Please eliminate the following sentence from Bullet 3 (Page 2 of 5):

~~These dissolved oxygen concentrations measured during 1999 suggest that the ground-water geochemistry at Site 9 is not being affected by operation of the remedial system at the Naval Exchange Service Station.~~ (ED)

Response—The text has been changed in the final report as recommended.

b. MEDEP recommends the following revision to Bullet 3 (Page 3 of 5):

Samples of Site 9 ground water have not reported significant concentrations of volatile organic compounds that would be commonly found in gasoline. Diesel range organics and gasoline range organics are not currently included in the analytical program at Site 9. ~~*which suggests impacts at Site 9 may be limited to potential impacts on site dissolved oxygen or Eh conditions.*~~ *(ED)*

Response—The text has been changed in the final report as recommended.

6. ***Ground-Water Monitoring and Sampling Program, Section 3.1.2, Page 3, 2nd Bullet***

a. Therefore, based on current data, a source of vinyl chloride west of that portion of Site 9 does not appear likely.

Please delete this sentence as it is contradictory to the rest of the paragraph. (ED)

Response—The text has been changed in the final report as recommended.

b. The second to last sentence does not adequately describe the last 2-year trend at MW-NASB-069, the monitoring well with the highest concentrations of vinyl chloride and 1,2-DCE. While the sentence is acceptable for the other monitoring wells, MW-NASB-069 must be mentioned as an exception to the rise-and-fall pattern of vinyl chloride concentrations. (RR)

Response—The following text has been inserted as the last sentence in Section 3.1.2, Page 3 of 5, 2nd Bullet:

The increase and decrease of vinyl chloride concentrations also occurs; however, the overall trend of vinyl chloride detected in samples from MW-NASB-069 over the last 2 years has been increasing.

7. ***Analytical Trend Graphs, Appendix A***

a. LT-901 Sediment shows that sampling was terminated when the lead level had risen to over 120 mg/L for the second time in two years. If lead was eliminated from the Long-Term Monitoring Program, it may be necessary to reinstate it. What was the justification for discontinuing this sampling? (RR and MTG)

Response—This topic was discussed at the 11 April 2000 Technical Meeting. During discussions related to the revision to the Long-Term Monitoring Plan, metals analysis was added to monitoring wells located immediately downgradient of the landfill as these would better assess metals impact rather than samples from LT-901. In addition, the drainage catchment from LT-901 includes parking areas and industrialized portions of the base. Therefore, water collected from LT-901 may be affected by sources unrelated to Site 9.

b. MW-NASB-227 volatile in ground water is missing all detections for TCE and PCE for Monitoring Events 14 and 15. Please revise this graph. (ED)

Response—The graph has been checked to ensure that detections for TCE and PCE for Monitoring Events 14 and 15 were included. Please note that TCE and PCE detected concentrations are included as part of the "Total VOCs" in the graphs for all the wells.

8. ***Response to Comments from Maine DEP on Monitoring Event 14 – November 1998***

a. Comment No. 5—It is hard to ascertain from the Navy's response when the mentioned field check for verifying a second seep drainage into the North Branch of the Unnamed Stream will be accomplished. No changes are observed on the Site Plan, Figure 1-2 of the 1999 Annual Report. Has the Navy field checked the second seep drainage? If so, please provide more specific information on as to the date of the field check and the outcome. If not, please provide information on when the field check will be performed. (RR)

Response—This issue was discussed at the 11 April 2000 Technical Meeting. The seep was checked during Monitoring Event 16 field events, and will be reported in the Monitoring Event 16 Report.

b. Comment No. 7—The corrected version of Table 8 as promised in the Navy's response, has not been received. When can the Department expect this revised table? (RR)

Response—We suggest that MEDEP make a pen and ink edit to Table 8 in Monitoring Event 14 Report for Site 9 to modify "Total 1,2-Dichloroethane" to "Total 1,2-Dichloroethene."

RESPONSE TO COMMENTS FROM THE
U.S. ENVIRONMENTAL PROTECTION AGENCY
FOR SITE 9, MONITORING EVENT 16, APRIL 2000
NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Michael Barry **DATED**: 3 July 2000

GENERAL

1. For consideration in the Event 17 Report: I thought we decided last year (before your time I think) we were going to represent the plume area above the MCL/MEG as one plume, rather than two "lobes" as in the Event 15 report? This is a minor issue, I'd be glad to discuss at a future technical meeting.

   Response—Comment noted. Beginning with the 2000 Annual Report for Sites 1 and 3 and Eastern Plume, the area between the two "lobes" that represent detected concentrations above the MCLs/MEG will be drawn as one plume area.

2. My copy of the Site 9 report was missing the SVOC results (Method 8270) that's done on a few wells downgradient of the landfill.

   Response—Comment noted. These results will be provided to EPA under separate cover.

OTHER OBSERVATIONS

3. I like the new data table format with the shaded for results above the MCL/MEG - much easier to read!

   Response—Comment noted.

SITE 9

4. Glad that VOC's went DOWN this time! The trend will be interesting.

   Response—Comment noted.

5. More wells were non-detect; i.e., what VOCs we have are in fewer wells.

   Response—Comment noted.

RESPONSE TO COMMENTS FROM
MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
FOR SITE 9, MONITORING EVENT 16, APRIL 2000
NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Claudia Sait **DATED: 5 October 2000**

The Maine Department of Environmental Protection (MEDEP or Department) has reviewed the report entitled *Monitoring Event 16 – April 2000, Site 9*, prepared by EA Engineering, Science, and Technology. Based on that review, the Department has the following comments and issues.

Each of our comments is followed with a code that indicates whether a response is required (RR), no response is required (NR), editorial correction needed (ED), or meeting discussion requested (MTG). No response is required for editorial corrections unless the Navy disagrees with the correction.

GENERAL COMMENTS

1. The report is clean of any serious problems, however, there are some changes that should be corrected or clarified in the annual report. (NR)

   Response—No response required. The Navy will include a detailed response to each specific comment.

2. The Department plotted the new concentration data for MW-NASB-069 on the graph in the 1999 Annual Report for Site 9. Vinyl chloride rose to a new high value of 55 µg/L, while 1,2-dichloroethene (total) dropped slightly. For the first time, vinyl chloride concentration exceeds the corresponding 1,2-dichloroetherne concentration. The Department's concern about the rising trend of vinyl chloride continues, particularly if degradation is slowing. (MTG)

   Response—The Navy agrees that this topic should be discussed at a Technical Meeting. It should be noted that vinyl chloride concentrations exceeded the corresponding 1,2-dichloroethene concentrations during the September 2000, also.

SPECIFIC COMMENTS

3. ***Gauging Activities, Section 1.2.1, Page 1***—It was noted in the Eastern Plume Monitoring Event 16 report that 2 inches of precipitation was received during the week before and during the water level gauging period. As the time frame appears to be nearly identical for both Site 9 and the Eastern Plume, the same precipitation statement should appear in the Site 9 report. (ED)

   Response—Water table elevations were gauged at Site 9 on 27 March 2000. Water table elevations were gauged at Sites 1 and 3 and Eastern Plume on 27 and 29 March 2000. A total of 2 in. of precipitation fell on 28 and 29 March 2000. Therefore, the precipitation statement for Site 9 will not be the same as the precipitation statement for the Eastern Plume.

4. ***Sampling Activities, Section 1.3.1, Page 2, 2nd Paragraph***—Reduced dissolved oxygen concentrations (<2.0 mg/L) were noted in samples from 9 monitoring wells, some as low as 0.00 mg/L.

   (a) In Table 4, only 8 wells have dissolved oxygen values of less than 2 mg/L. Also, no well has a value of 0.00 mg/L, the lowest being 0.08 mg/L. Please correct the text. (ED)

   Response—As the monitoring event reports are issued as final, the requested edits will not be addressed in the monitoring event report. However, more care will be taken in the future to ensure that the correct water quality parameter results are reported.

   (b) The Department suggests that in the future, monitoring event reports should show DO values rounded to the nearest 0.1 mg/L. The hundredths have no meaning and likely are not repeatable for sampled water with low readings. Likewise, as not to overstate our ability to determine actual representative values. (MTG-TEG)

   Response—The Navy agrees that dissolved oxygen values should be rounded to the nearest 0.1 mg/L. Future monitoring reports will present dissolved oxygen results as such.

5. ***Analytical Data Quality Review, Section 1.8, Page 4, 1st Paragraph***—This paragraph states that the remedial action is monitored natural attenuation at Site 9. While this is somewhat true, the Site 9 ROD remedy was termed "*natural attenuation with monitoring and institutional controls*" as required by MEDEP and EPA. It is important that this language remain consistent throughout the Site 9 reports, as the completeness of monitoring does not meet the EPA's definition of monitored natural attenuation. The difference appears subtle, but in actuality, is not. Please correct the text. (ED)

   Response—The suggested edit will be incorporated into future monitoring event reports.

6. ***Analytical Data Quality Review, Section 1.8, Page 5, Last Paragraph***—It seems strange that non-detect results should be considered estimated. Please explain what this means. A large number of compounds are involved. The table of data to which this applies (Table A-5, SED-10 data) does not list or mention the possibility that other compounds may be present in the sample. Table A-5 gives detected values for 1,2-dichloroethene (total) and trichloroethene. The qualification listing in Section 1.8 includes 1,2-dichloroethene, but not trichloroethene. Why?

   Please provide explanation for the above questions and include in the Annual Report. (RR)

   Response—Estimated organics that are below the CRQL are qualified as estimated because the quality control results did not meet criteria specified in the QAPP. In this instance, the matrix spike recoveries were low and, therefore, it is probable that the analysis is biased low for that analyte, and values reported in the sample may underestimate the actual concentration. Table A-5 reports only the contaminants of concern and any confirmed hits of any other analytes found in the samples. The results for trichloroethene were qualified in a prior statement.

7. ***Summary of Water Quality Indicator Parameters, Table 4***

(a) Ground-water temperature measurements can be quite useful in analyzing the ground-water flow regime. The range in measured temperatures in this table is 8.56 to 18.83 °C. For the April timeframe, the Department questions the representativeness of in situ of temperatures over 13 °C. MEDEP is aware that an elevated temperature can be produced by the pump at low flow rates. However, inspection of information in Appendix B.2 shows no consistency between the high temperatures compared with flow rate, duration of pumping, well drawdown or well (screen) depth. What other field sampling conditions might be affecting which wells deliver groundwater at elevated temperatures? (RR)

Response—All but one well (MW-NASB-071) that had an ending temperature of greater than 13 °C had a start temperature of less than that. It is possible that the temperature of the ground water increased while it was in the flow cell due to the slow pumping rate.

(b) The Navy will need to consider how it will obtain these parameters if diffusion sampling replaces low-flow sampling. Can some of the parameters, say temperature, be obtained by lowering a YSI sensor head into wells? This topic might best be addressed at a technical meeting. (MTG)

Response—It is possible to collect water quality parameters within the well, with the exception of turbidity. Water quality parameters can be collected prior to inserting the sampler into the well and/or following the removal of the sampler. The Navy agrees that this topic can be best addressed at a technical meeting.

RESPONSE TO COMMENTS FROM THE
U.S. ENVIRONMENTAL PROTECTION AGENCY
ON THE MONITORING EVENT 17 (SEPTEMBER 2000) REPORT FOR SITE 9
NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Michael S. Barry DATED: 28 December 2000

Thank you for the opportunity to review the above reports, which were prepared for the Navy by EA Engineering, Science and Technology and dated in November 2000. Upon our review, the EPA has several comments and observations that are attached.

Since these reports are released as a final document, we hope our comments may provide opportunity to discuss and possibly resolve some issues prior to drafting the annual reports. Some of our comments, especially regarding display of the plume in specific areas, are long standing but may not be resolved until after future work discussed at the technical meeting on December 13-14 is complete.

1. No comments to the monitoring event report, will look forward to the annual report.

RESPONSE TO COMMENTS FROM THE MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION FOR MONITORING EVENT 17 – SEPTEMBER 2000, SITE 9, DATED NOVEMBER 2000, NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Claudia Sait **DATED: 14 February 2001**

GENERAL COMMENTS

The Maine Department of Environmental Protection (MEDEP or Department) has reviewed the report entitled *Monitoring Event 17 - September 2000, Site 9,* dated November 2000, prepared by EA Engineering, Science, and Technology. Based on that review, the Department has the following comments and issues:

1. MEDEP reviewed the new VOC concentration data for MW-NASB-069 with respect to this well's graph in the 1999 Annual Report for Site 9. It was observed that vinyl chloride rose to a new high of 60 µg/L, while 1,2-dichloroethene maintained its recent high levels, registering 51 µg/L. For the second sequential monitoring event, vinyl chloride concentration exceeds the corresponding 1,2-dichloroetherne concentration. As proposed during our last conference call a discussion at the March technical meeting is warranted. (MTG)

   Response—The Navy agrees that this topic should be discussed at the March 2001 Technical Meeting.

2. The RAB has acknowledged that long-term monitoring programs are "living documents" that will be changed periodically. With this in mind, MEDEP requests that the following topic be added to agenda of the Technical Meeting scheduled for March 7, 2001.

   In looking at the spatial relationship of VOCs relative to the elevation of well screens, MEDEP believes that NASB-21 should be included in the Long-Term Monitoring program. NASB-21 is a deep companion well to NASB-80, having a screened elevation between 8.5 and 13.5 ft msl. This well is screened 1 ft lower elevation than NASB-69, where the highest detection of vinyl chloride consistently occurs. NASB-21 is about 150 upgradient of NASB-69. NASB-80 had 9 µg/L of vinyl chloride in the September 2000 monitoring event, even though its screen is 25 ft higher elevation than the adjacent NASB-21. Furthermore, during the 1996 source investigation, the newly installed NASB-21 had a very low detection of vinyl chloride.

   The State would like to see this well sampled beginning in the April 2001 event. (MTG)

   Response—The Navy agrees that the issue of adding monitoring well MW-NASB-21 to the Long-Term Monitoring Program at Site 9 should be discussed at the March 2001 Technical Meeting.

3. The field parameter values and inorganic chemistry results for Monitoring Event 17 seem to show a progression of downgradient effects of air sparging in the NEX area. The Department will comment in more detail upon review of the 2000 Annual Report. (NR)

   Response—The Navy looks forward to the MEDEP's comments after reviewing the 2000 Annual Report. No response required.

SPECIFIC COMMENTS

4. ***Quality Assurance/Quality Control, Section 1.7, Page 4***—The remedy for Site 9 must be stated as "*natural attenuation with monitoring*", as it is significantly different that "monitored natural attenuation", per USEPA definitions. Please correct on p. 5 (last sentence) also. (ED)

   Response—As the monitoring event reports are issued as final documents, the requested edit will not be made. However, this request will be addressed in future reports.

5. ***Analytical Data Quality Review, Section 1.8, Page 5, Top Bullet***—

   a. Why would a detection of potassium in ground water not be expected? Maine ground water commonly has a potassium content of 1 to 5 mg/L, and prior monitoring event detections in this range have not been questioned. Unless extenuating circumstances are involved and are discussed in this report, this bullet should be deleted. (ED)

      Response—As the monitoring event reports are issued as final documents, the requested edit will not be made. In future reports, monitoring well samples will not be evaluated by the source water blank, as these samples are collected with dedicated sampling equipment.

   b. The same standards should also be applied to sodium. (ED)

      Response—As the monitoring event reports are issued as final documents, the requested edit will not be made. In future reports, monitoring well samples will not be evaluated by the source water blank, as these samples are collected with dedicated sampling equipment.

   c. Appendix C.6.3 (page C-8) should be reviewed for appropriateness, concerning potassium and sodium in source water. (RR)

      Response—As the monitoring event reports are issued as final documents, the requested edit will not be made. In future reports, monitoring well samples will not be evaluated by the source water blank, as these samples are collected with dedicated sampling equipment.